

Gunnery Department MLRS Division

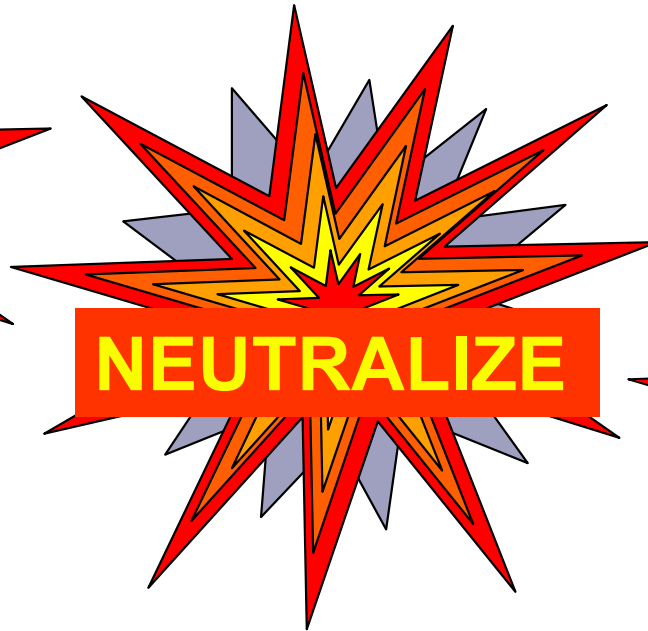
“Standards Start Here”



Field Artillery Officer Basic Course

MLRS SAFETY

The Mission of the Field Artillery is to ...



the enemy by cannon, **ROCKET** and **MISSILE** fire
and to help integrate all fire support assets into
combined arms operations.

Learning Activities

1. Conduct OPAREA Safety
2. Conduct Firing Point Safety
3. Conduct Point to Point Safety

Live Fire Exercises

According to FM 25-101 Battle Focused Training,
live fire exercises...

“closely replicate battlefield conditions. They develop confidence and esprit, as well as reinforce soldier, leader and unit discipline”

Key Personnel

- Installation Range Officer
- Range Control
- Commander
- Officer in Charge
- Firing Platoon Leader
- Firing Platoon Sergeant
- Launcher Section Chief

Methods of Safety

OPAREA

Firing Point

Point to Point

OPAREA Method

OPAREA Safety

- Safety computed for a firing area and a target area
- Installation impact area significantly reduced by factors W_{\max} X_{\max} and Y_{\max}
- Unit determines SDZ
- Unit computes safety data and Safety “T”

Advantages and Disadvantages

- Advantages

- Allows most training value for FDC and Launcher Crews
- Most realistic, tactically

- Disadvantages

- Construction of SDZ is complex
- Needs large Installation Impact Area

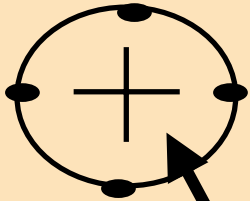
Phase I

- Outline Usable Portion of Impact Area
- Index center of firing area and apply radius for launcher firing area (1,000 m)

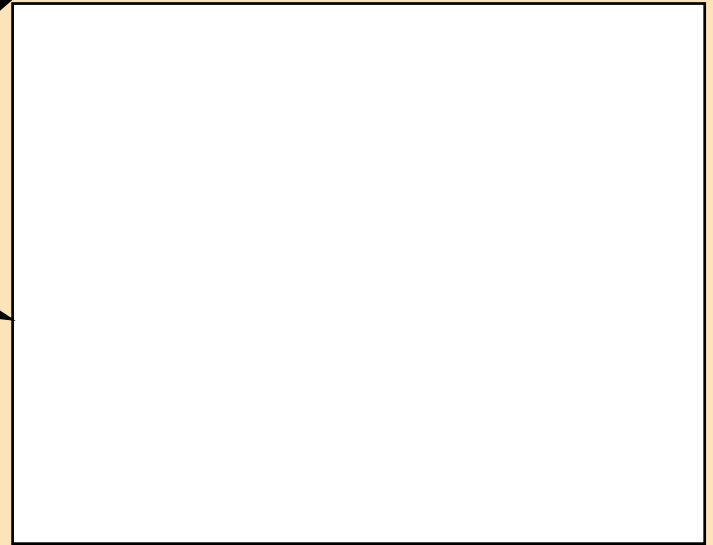
Phase I

Installation Impact Area

Usable Portion



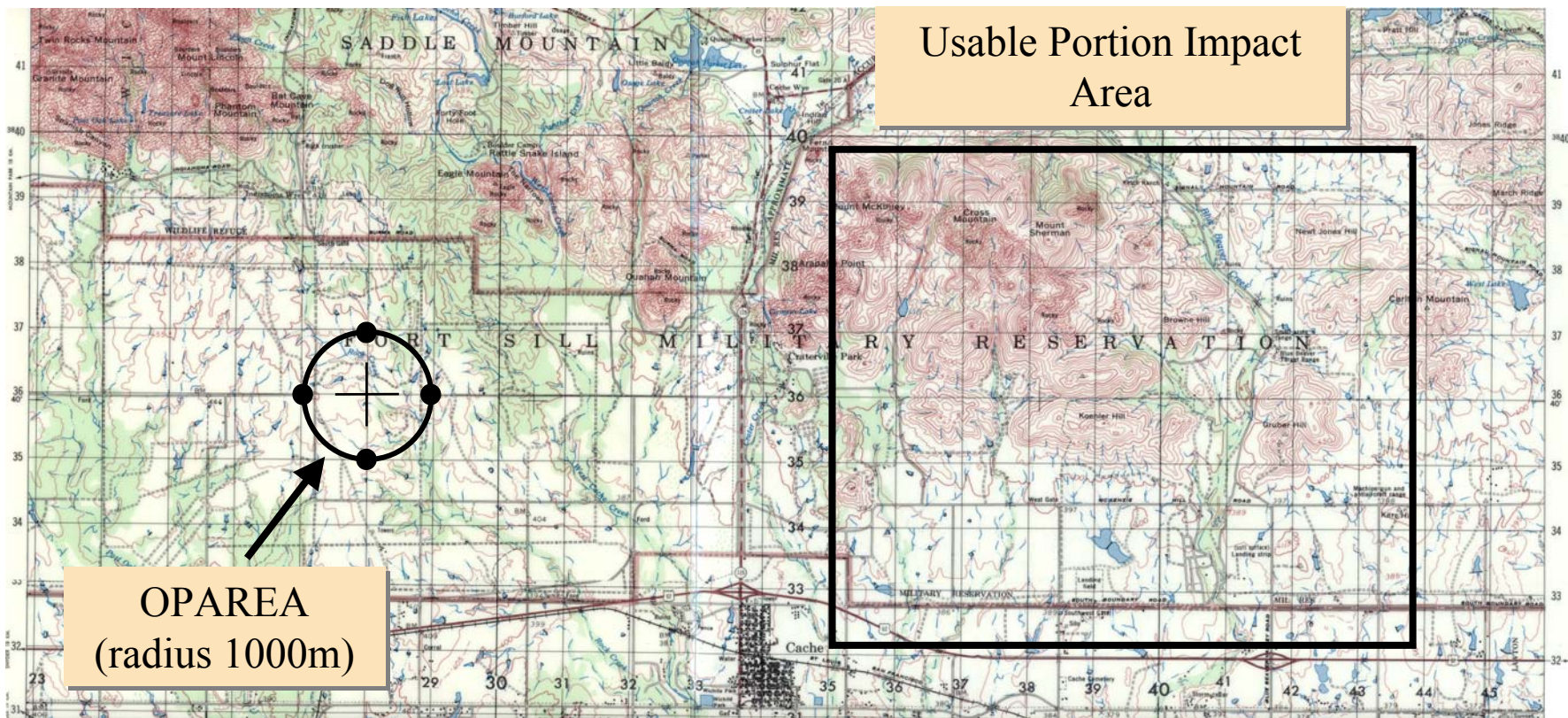
OPAREA (radius 1000 m)



Practical Exercise

- Munitions Fired: M28A1 Rockets
- Installation Impact Area
 - Grids: NP35003980
 - NP43803980
 - NP35003215
 - NP43803215
- Center OPAREA Grid: NP28003600

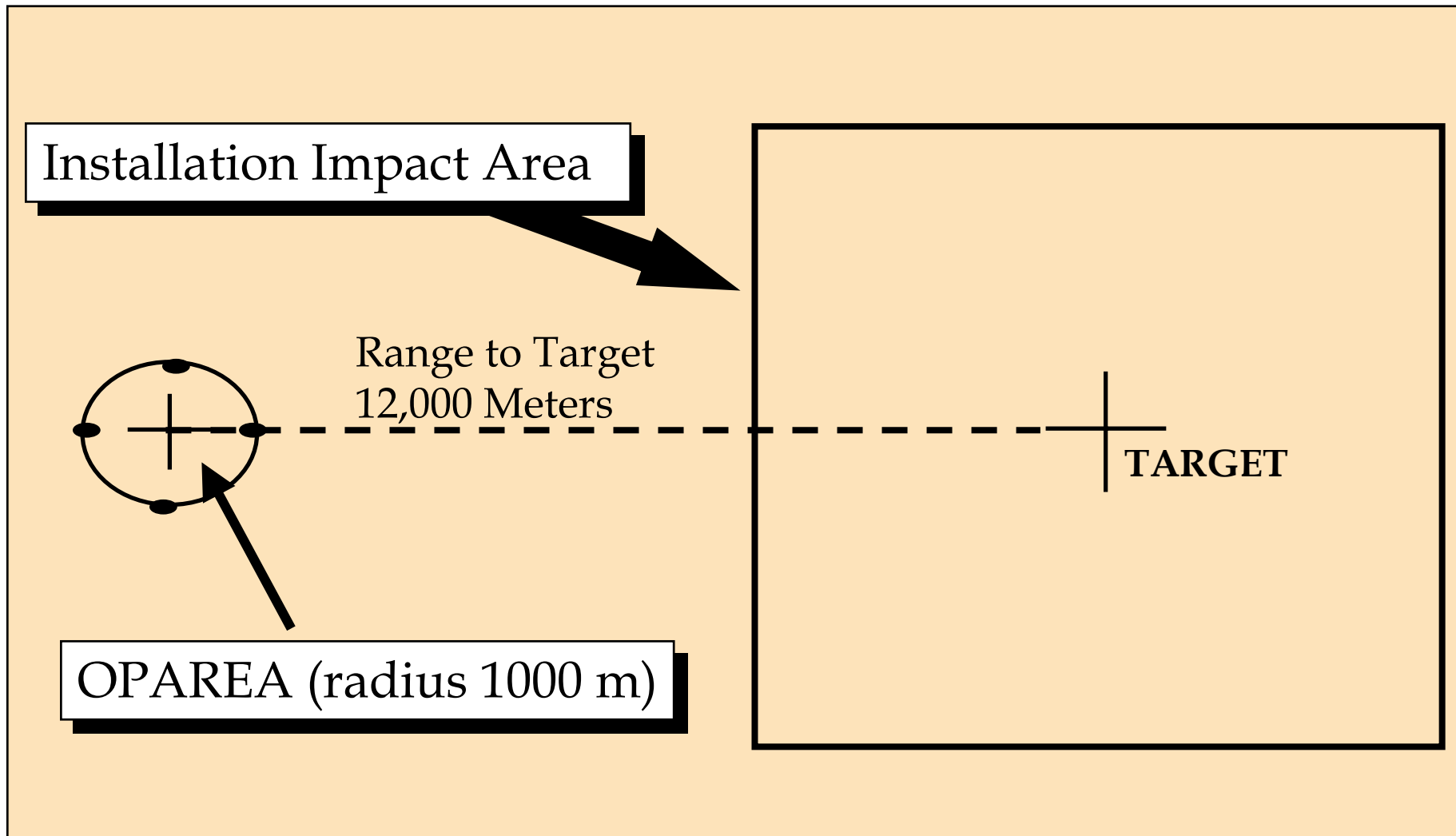
Phase I



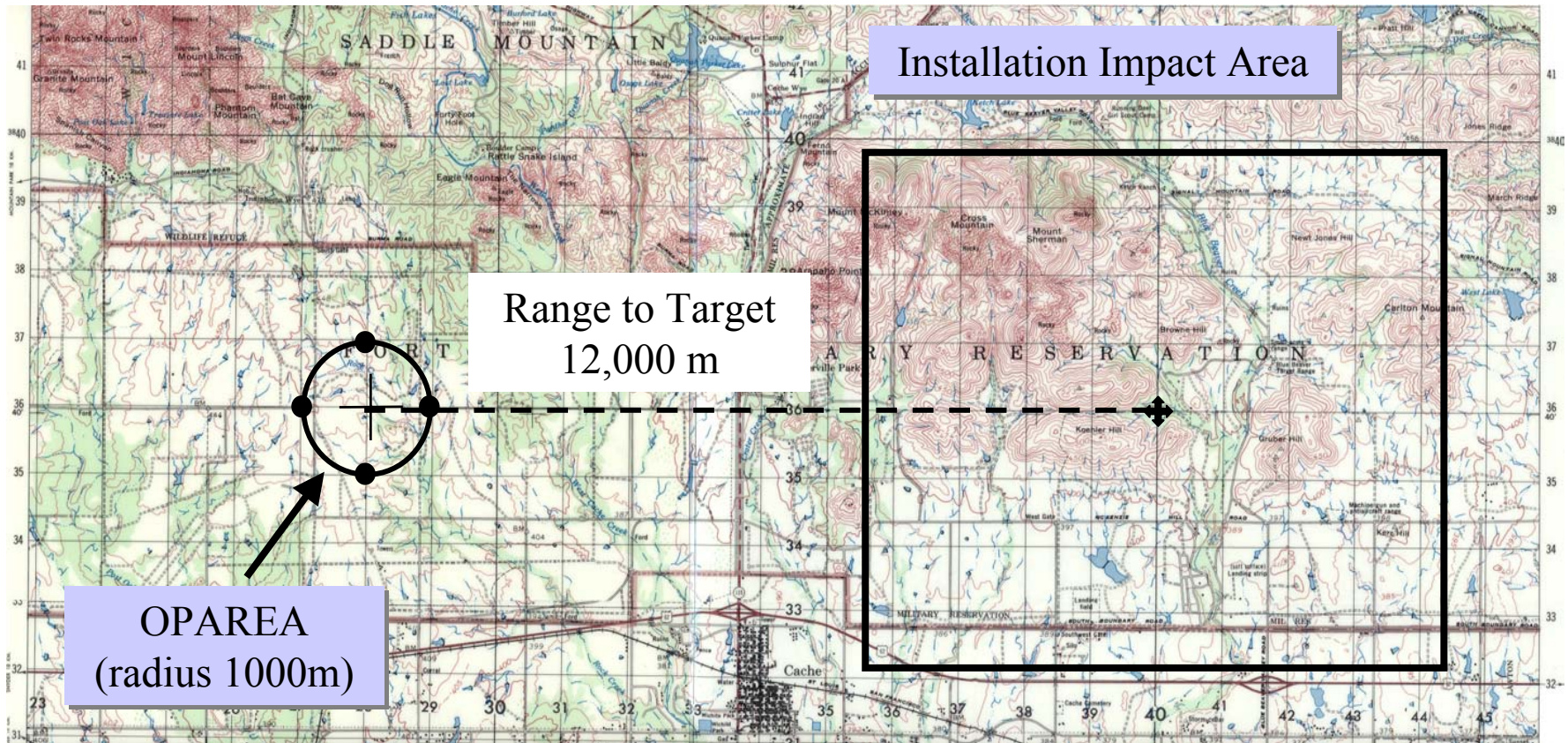
Phase I

- Index geographical center of target in Impact Area (12000 m from center of OPAREA)
- Draw a segmented line connecting the center of the OPAREA and the geographic center of the Impact Area

Phase I



Phase I



Surface Danger Zone – Impact Area

- Determine values for W_{\max} X_{\max} & Y_{\max}
- Entry value determined from range between the following:

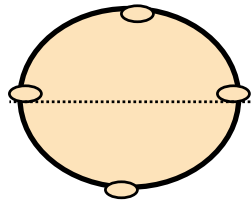
W_{\max} REAR edge of OPAREA to target

X_{\max} FORWARD edge of OPAREA to target

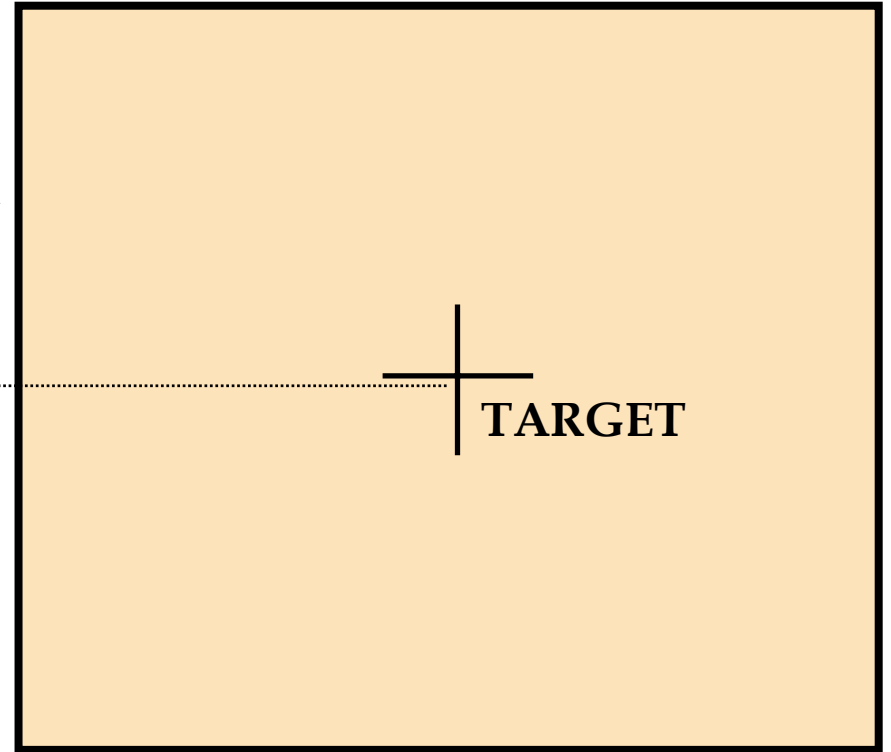
Y_{\max} FORWARD edge of OPAREA to target

Phase I

Installation Impact Area

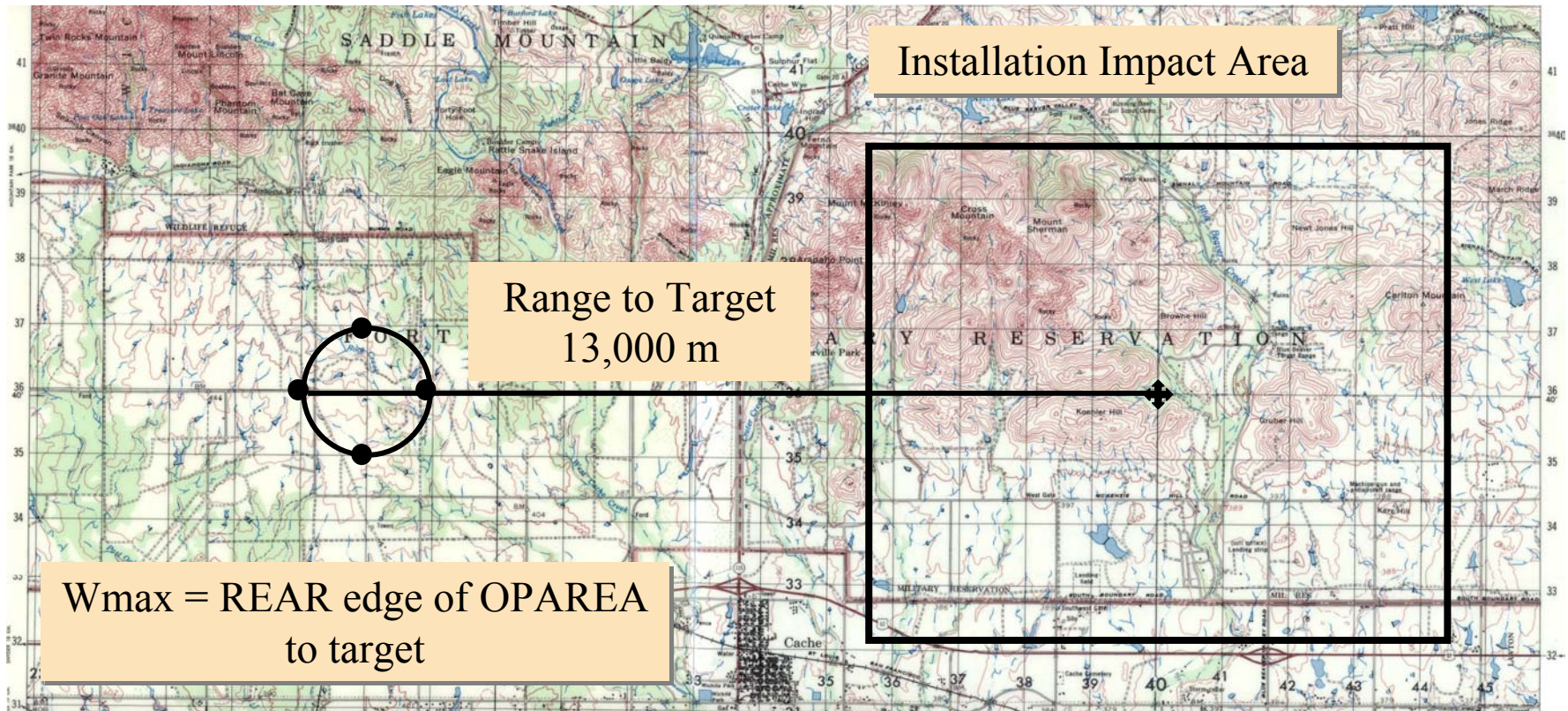


13,000 m



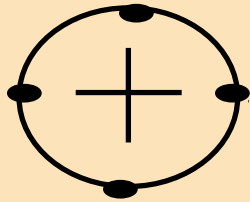
W_{\max} REAR edge of OPAREA to target

Phase I



Phase I

Installation Impact Area

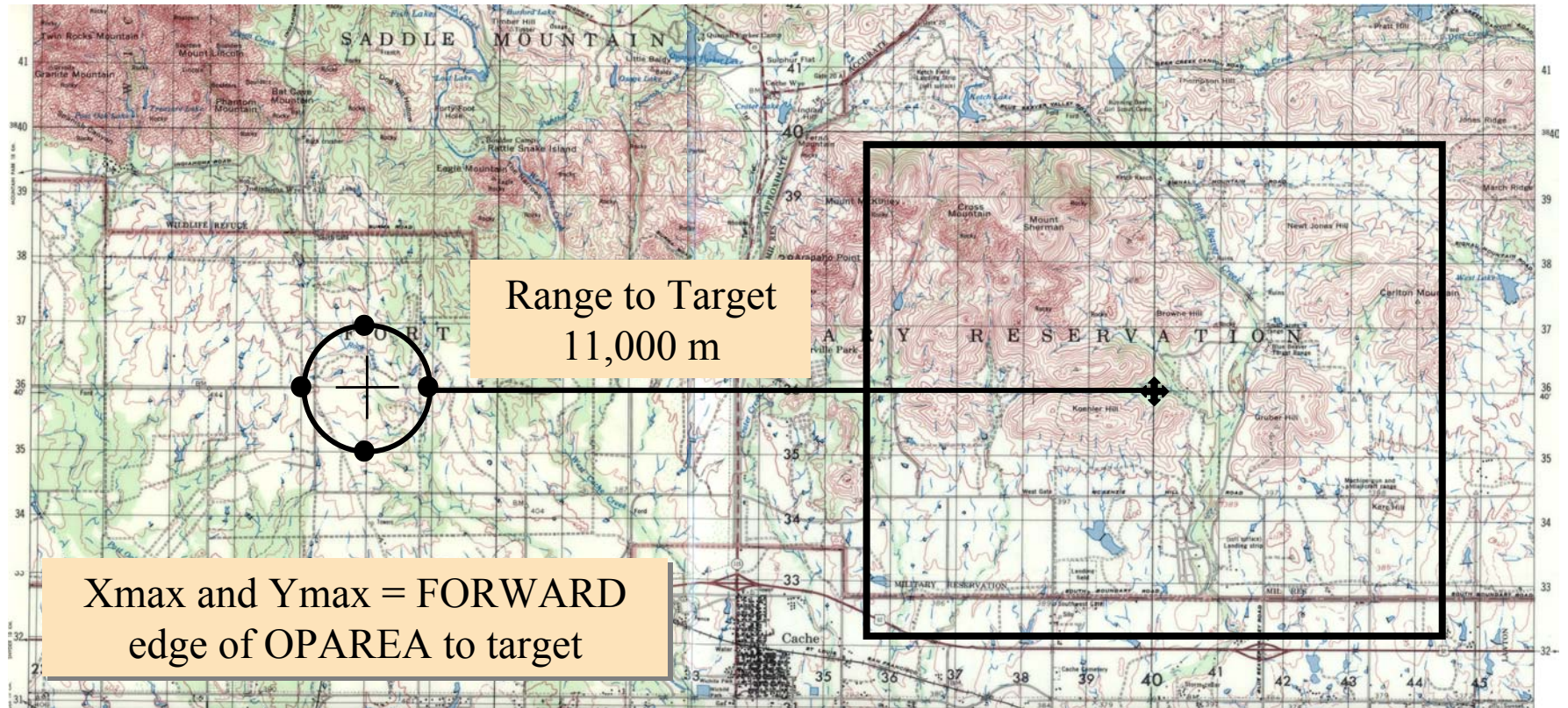


11,000 m

TARGET

X_{\max} and Y_{\max} FORWARD edge of OPAREA to target

Phase I



Entry Ranges

M28A1 Entry Ranges

W_{\max} 13,000

X_{\max} 11,000

Y_{\max} 11,000

Use table J-2 (p J-4) to determine the safety values

Safety Values – M28A1

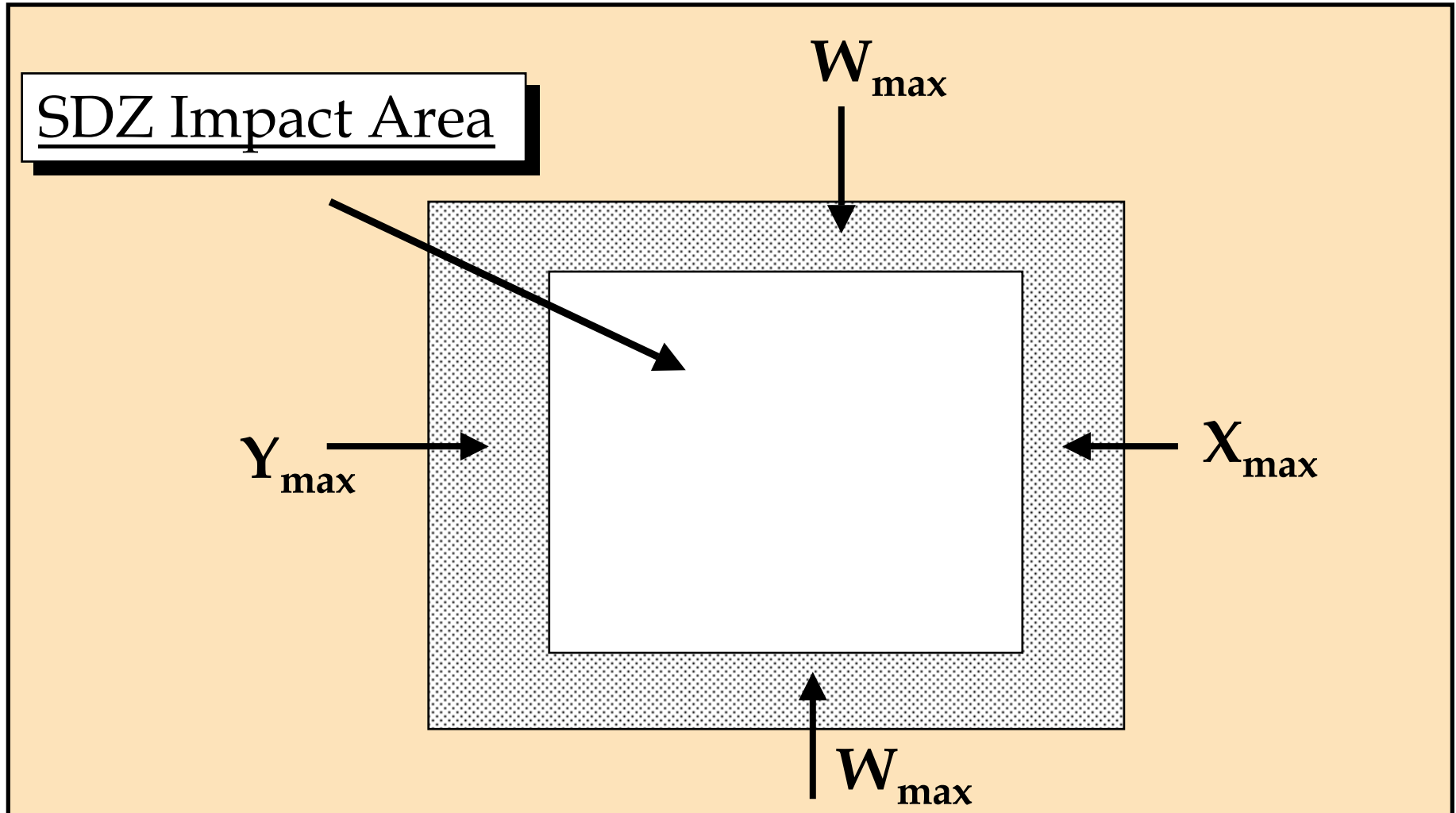
W_{\max} 850 m

X_{\max} 1,800 m

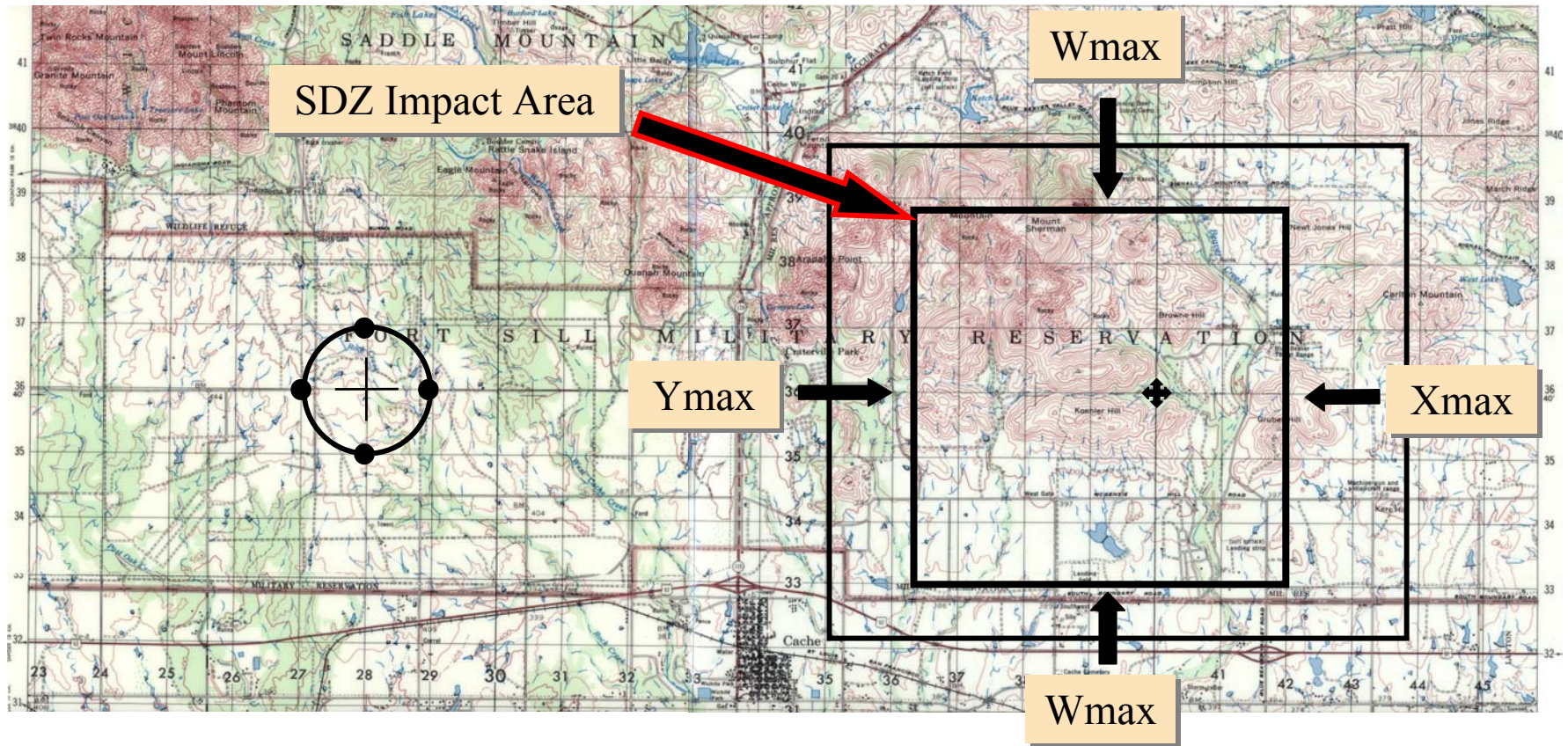
Y_{\max} 1,180 m

Apply values from the edge of the impact area
TOWARD THE TARGET

SDZ – Impact Area



SDZ – Impact Area



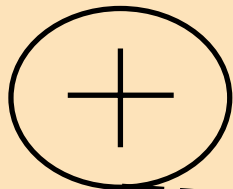
Phase II – Azimuth Limits

- Draw Right Azimuth Limit from the most RIGHT position and draw Left Azimuth Limit from most LEFT position in OPAREA
- Azimuths must keep all rounds within SDZ Impact Area

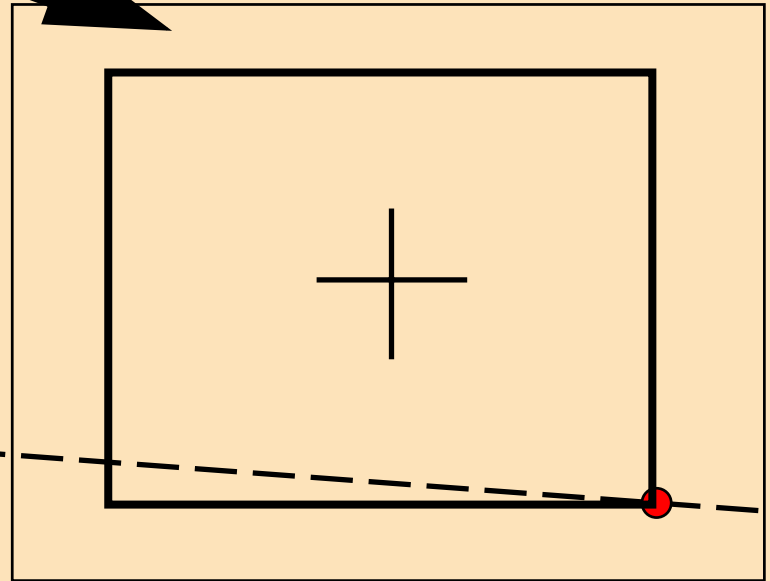
Phase II

Safety fan for right side of OPAREA

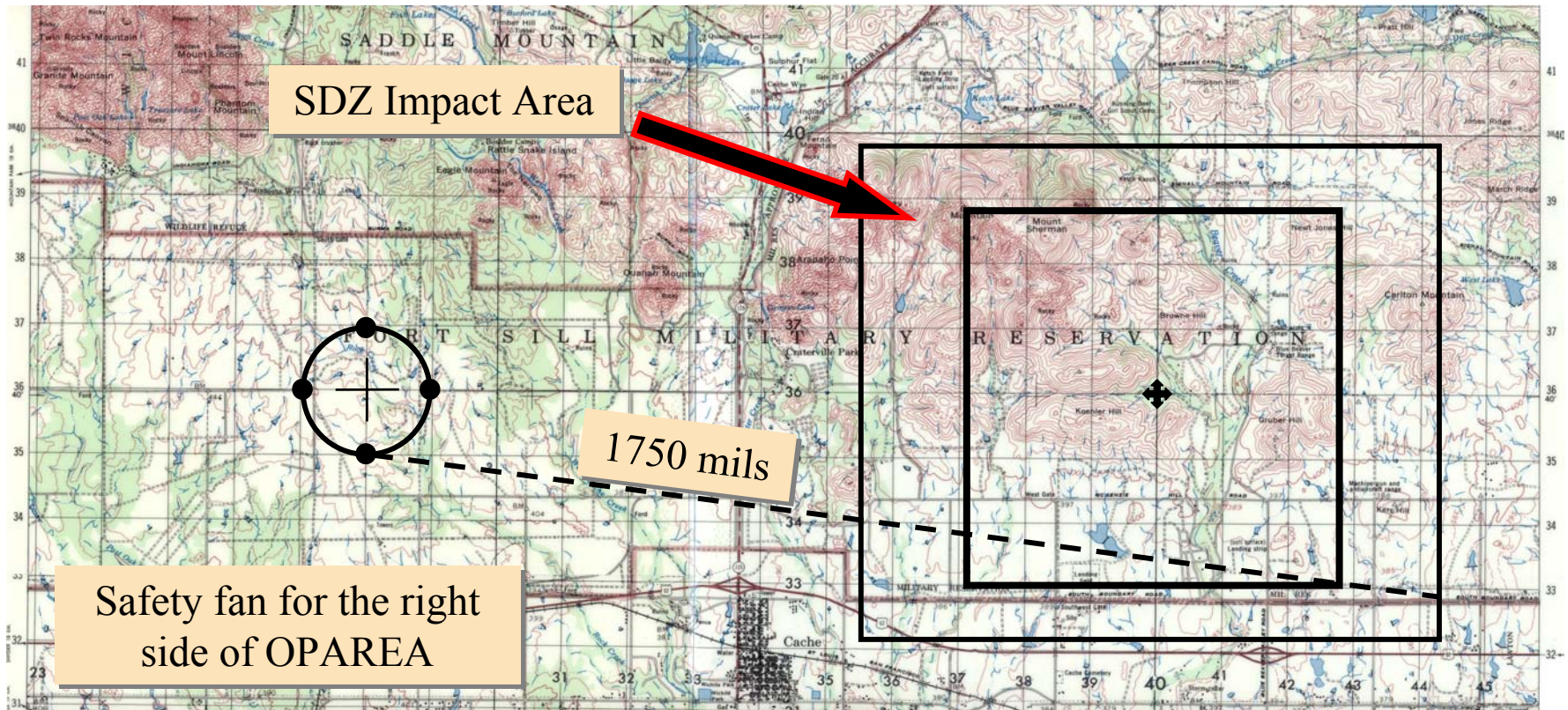
Installation Impact Area



1750 mils

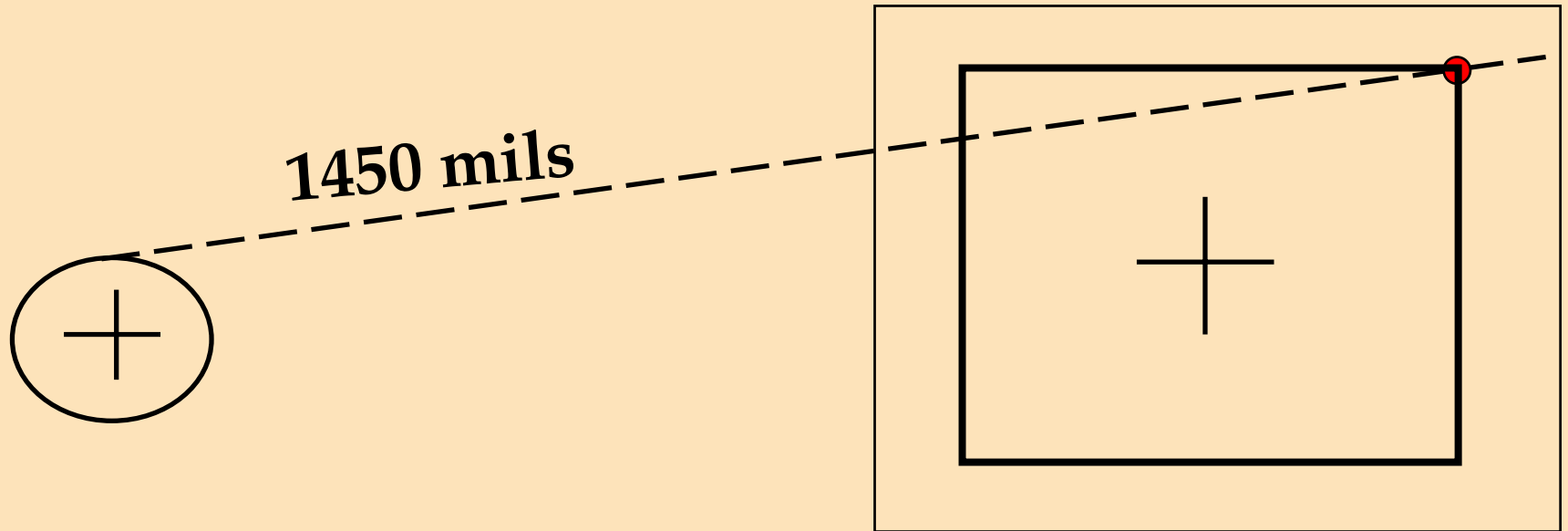


Phase II

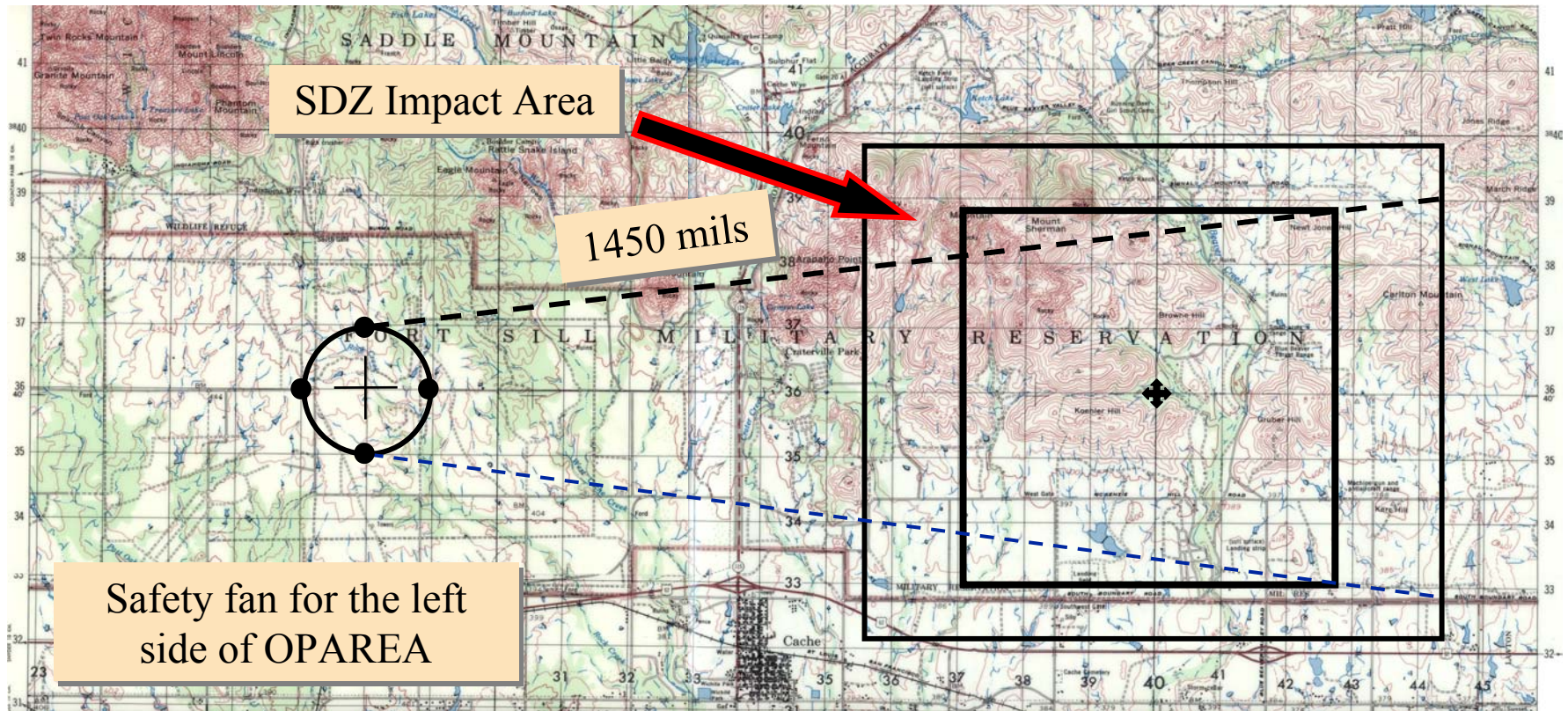


Phase II

Safety fan for left side of OPAREA



Phase II

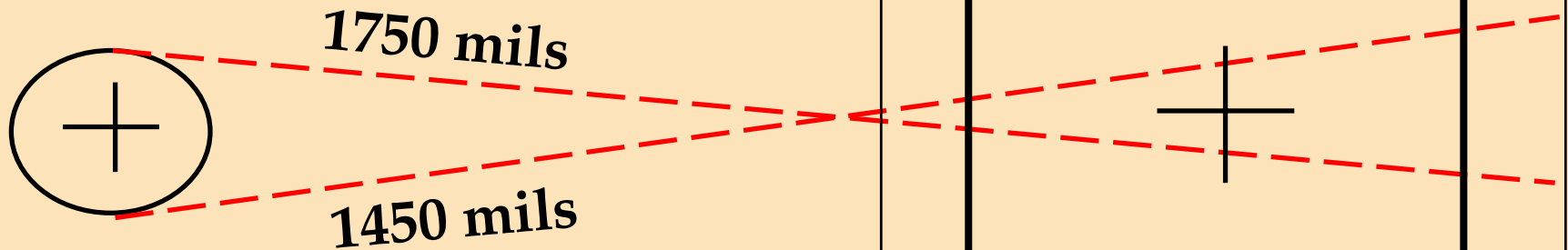


Phase II – Azimuth Limit Calculations

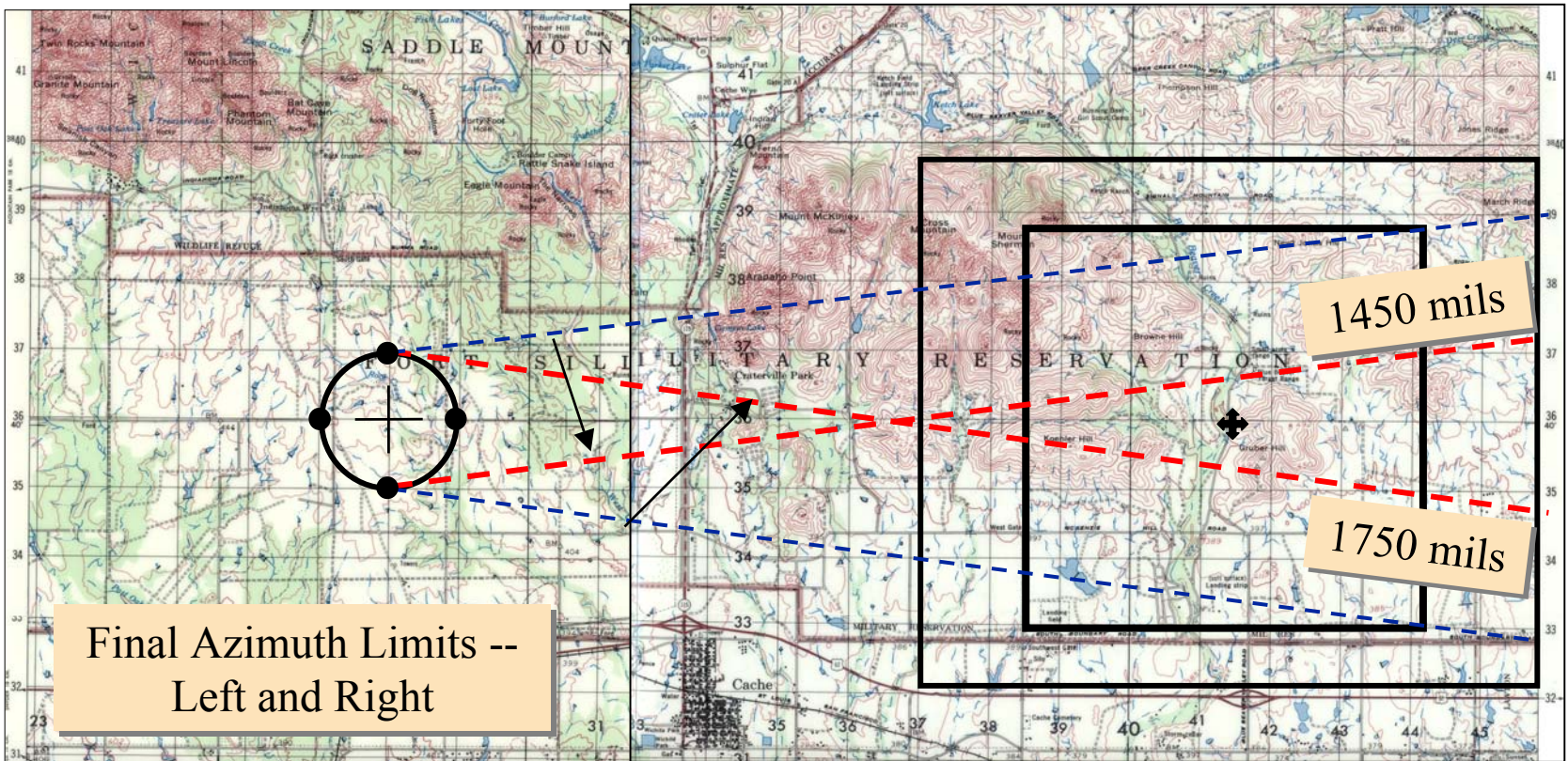
- Apply value of left azimuth limit to right most position **1450**
- Apply value of right azimuth limit to left most position **1750**
- These azimuth limits will be used to complete a TGT Selection Box

Phase II – Azimuth Limit Calculations

Final Azimuth Limits--Left and Right



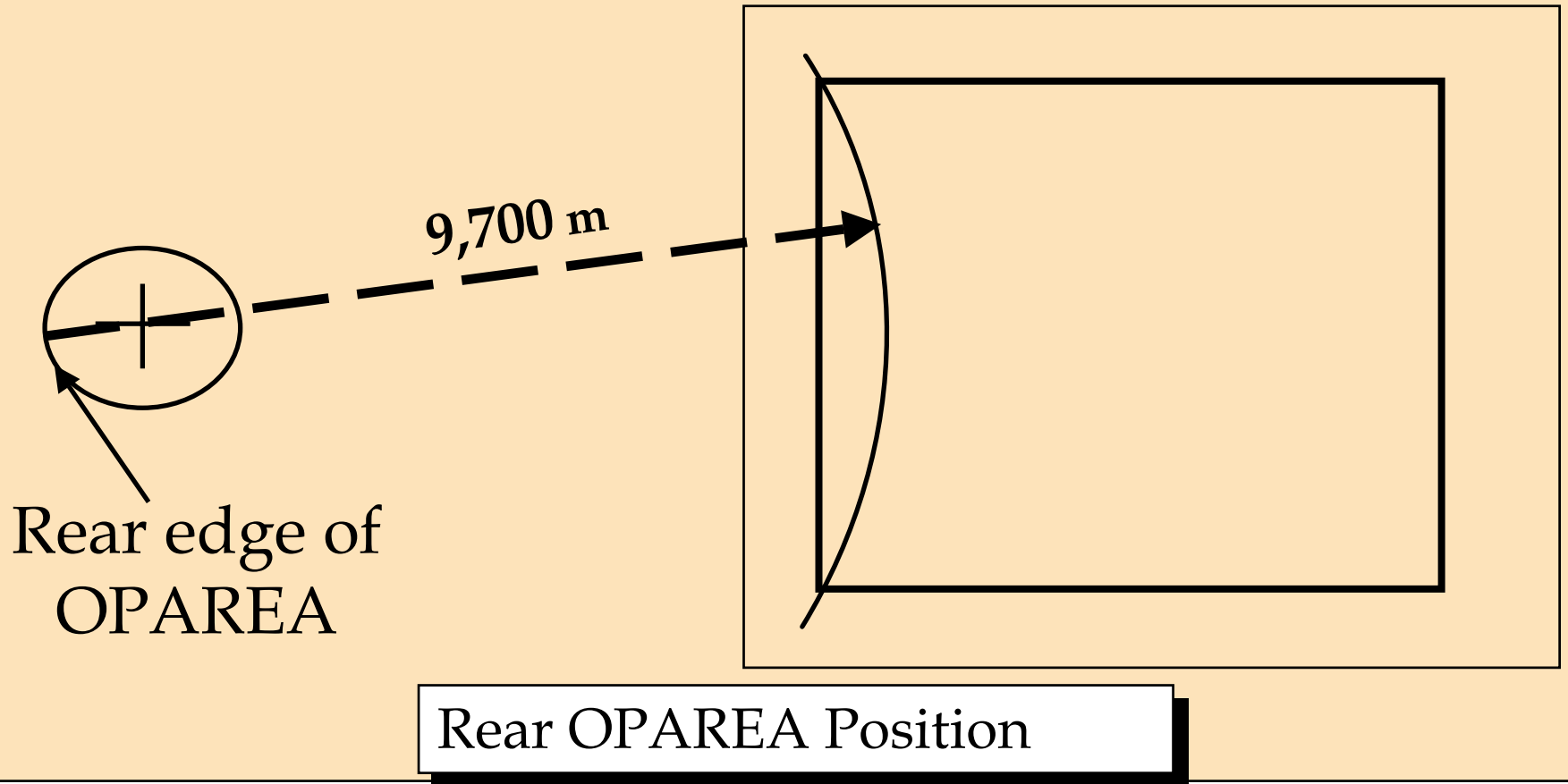
Azimuth Limits



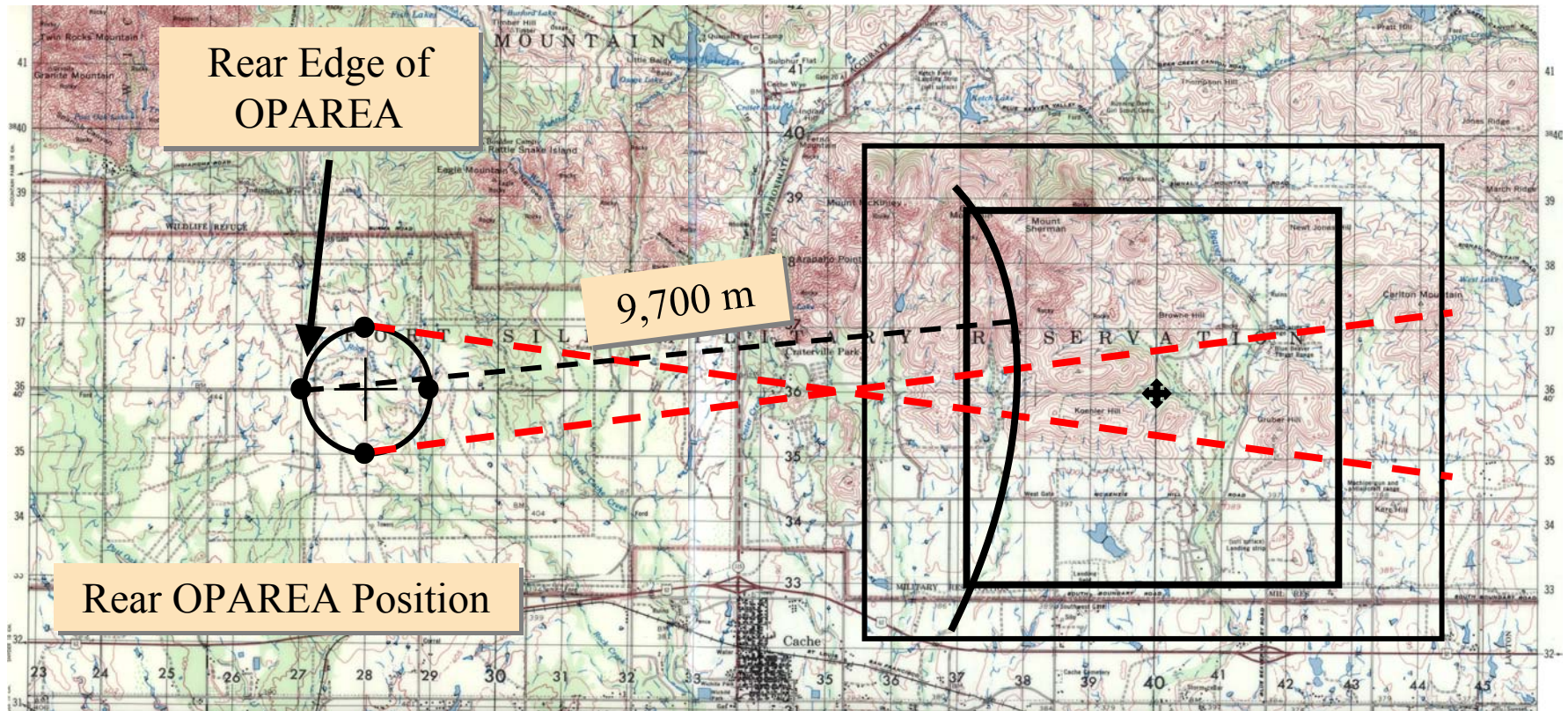
Quadrant Elevation

- Determine Min Range Value:
From rear OPAREA position to near edge of the SDZ impact area within the azimuth limits.

Range Limit Calculations



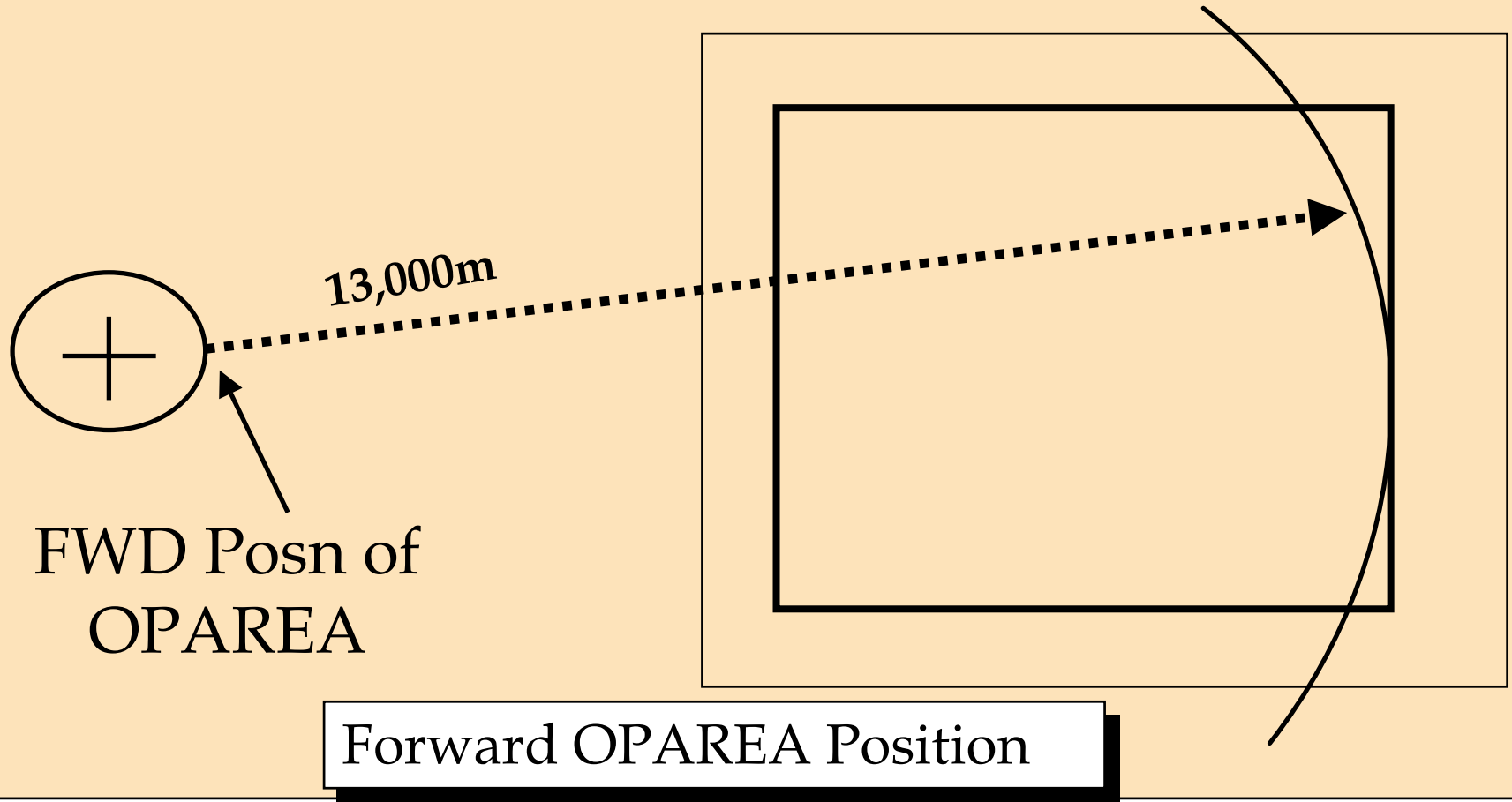
Range Limit Calculations



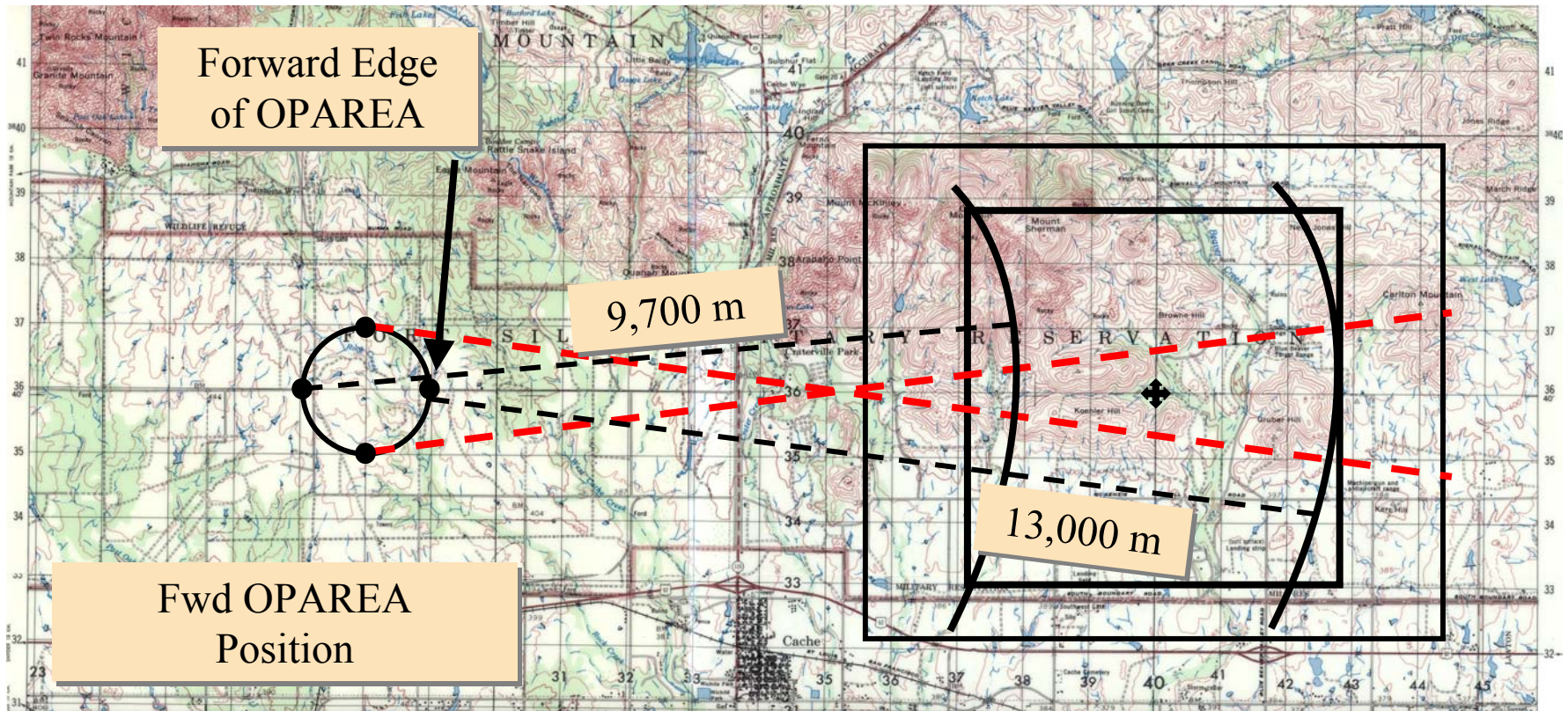
Quadrant Elevation

- Determine Max Range Value:
From forward OPAREA position to the rear edge of the SDZ impact area within the azimuth limits.

Range Limit Calculations

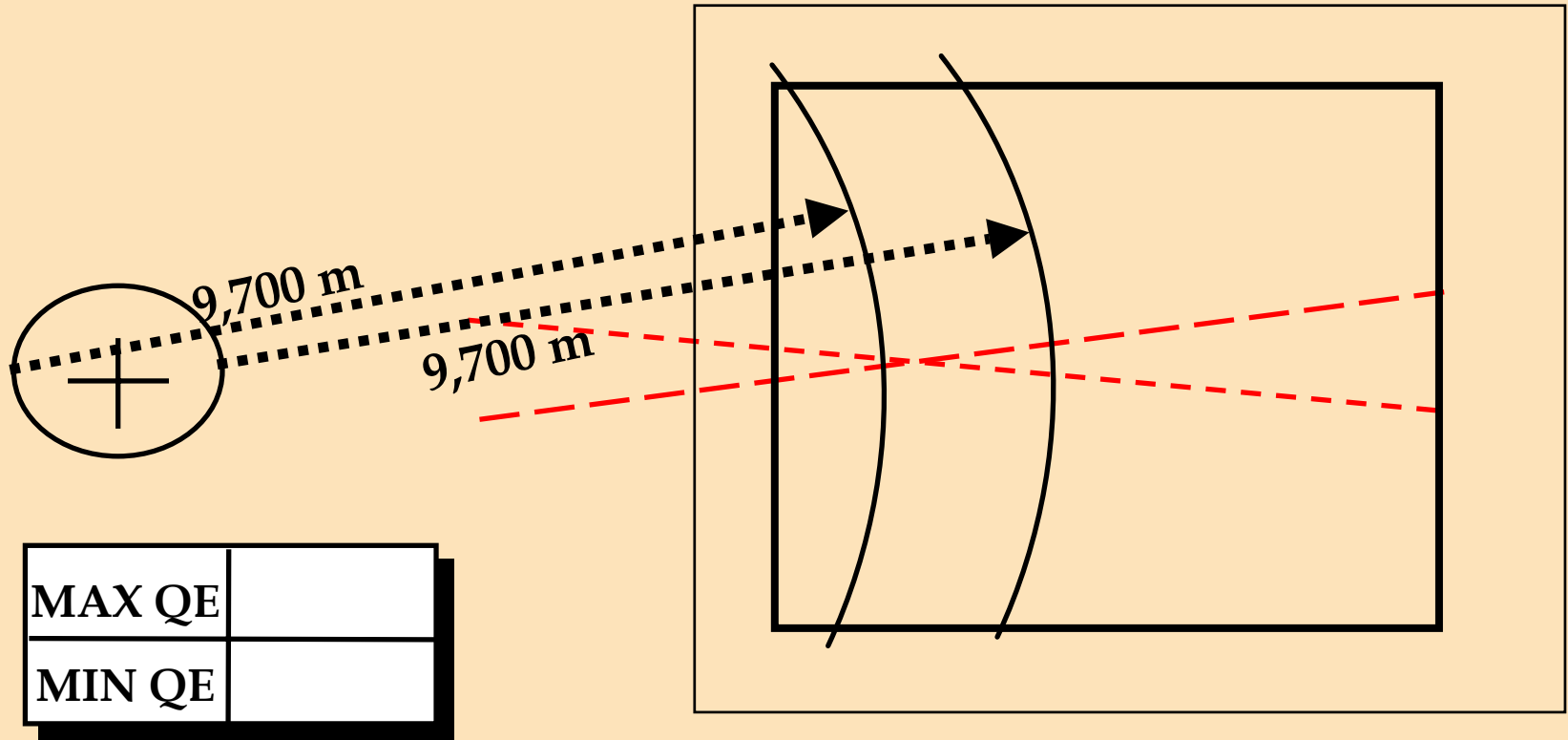


Range Limit Calculations



Derive Minimum Range

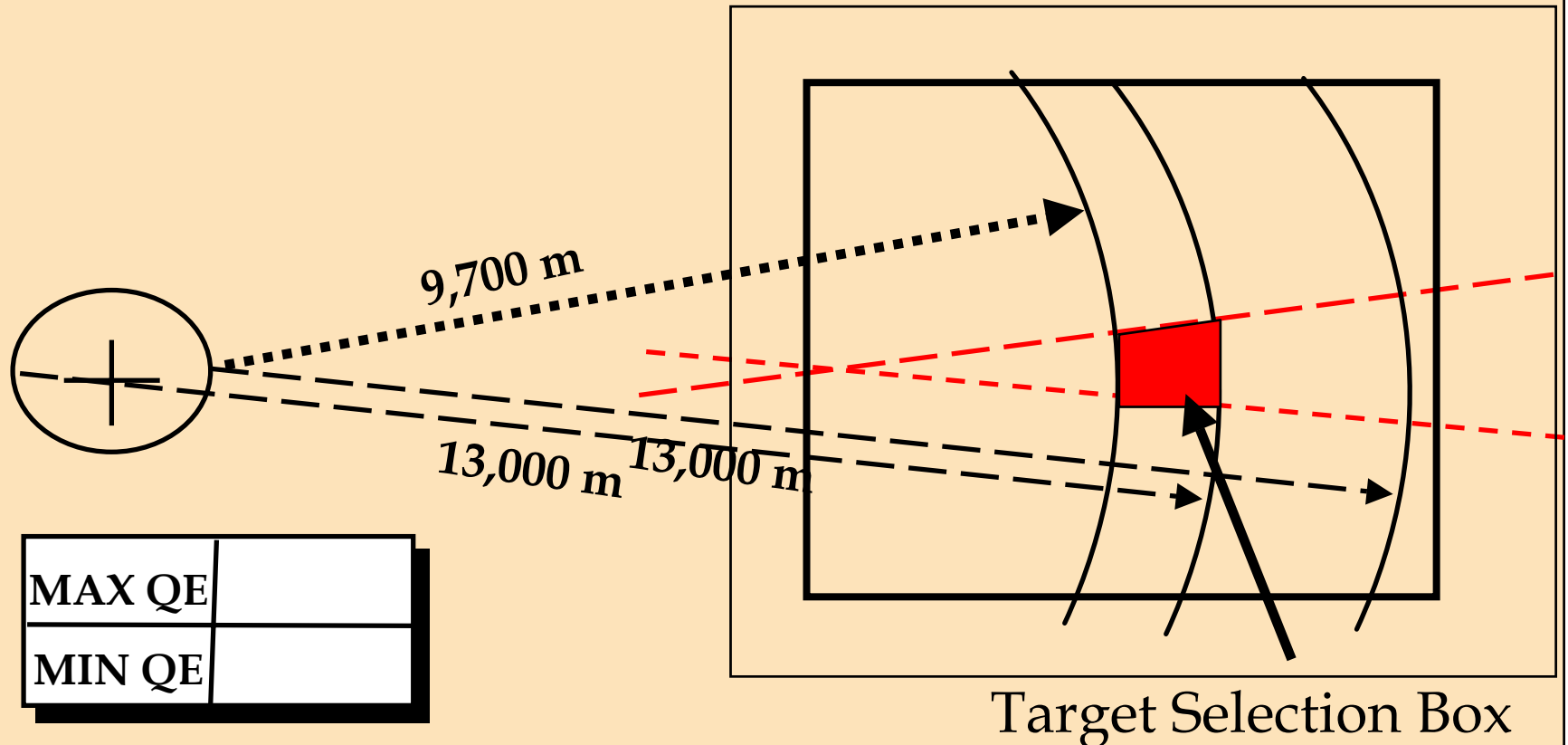
- ➔ Apply minimum range from rear position to forward position of OPAREA



Launcher FCS Solution (versus APP "K-19")

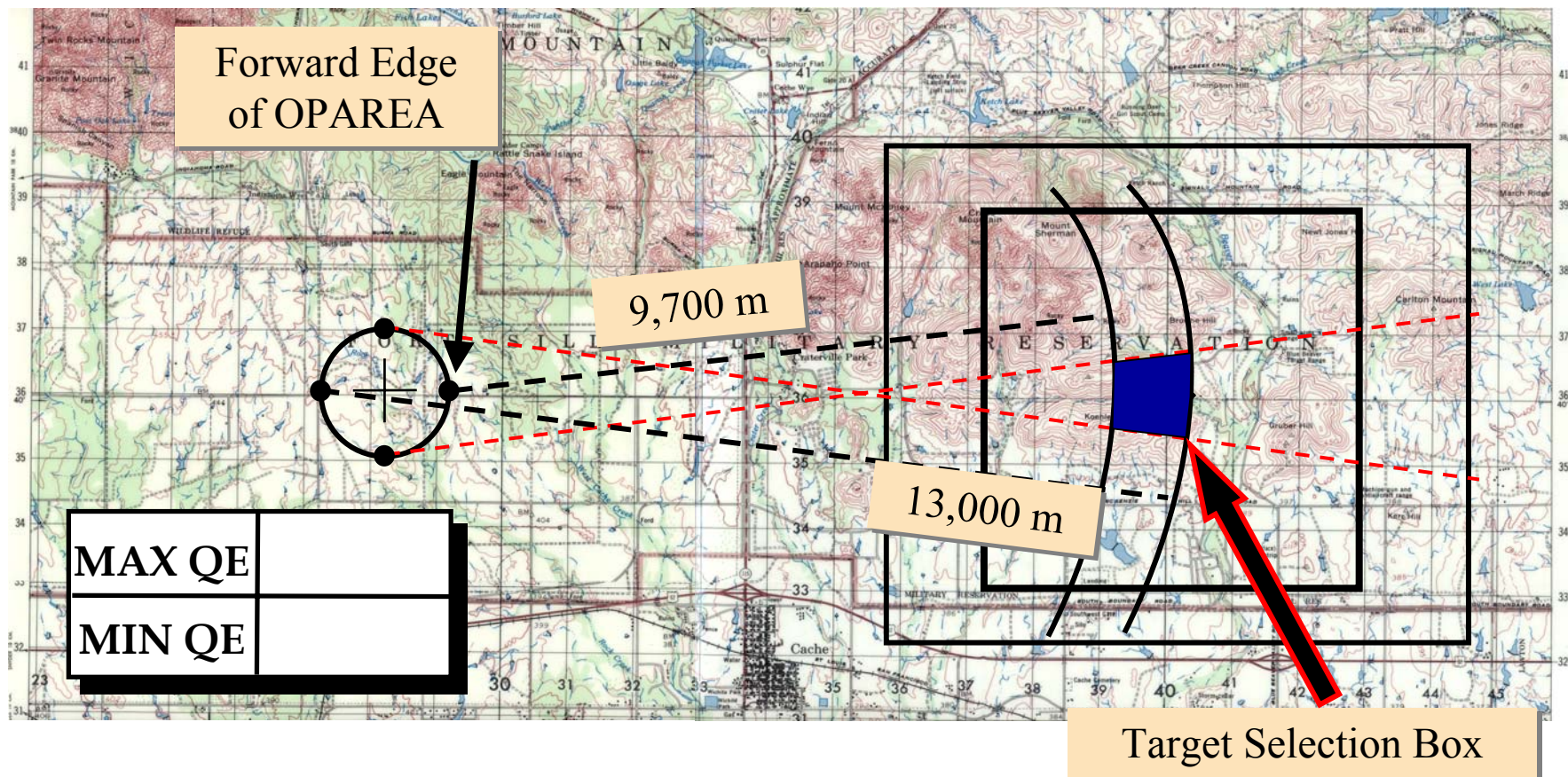
Derive Maximum Range

- 📌 To Derive Maximum Range:
Apply maximum range from forward position to rear position of OPAREA



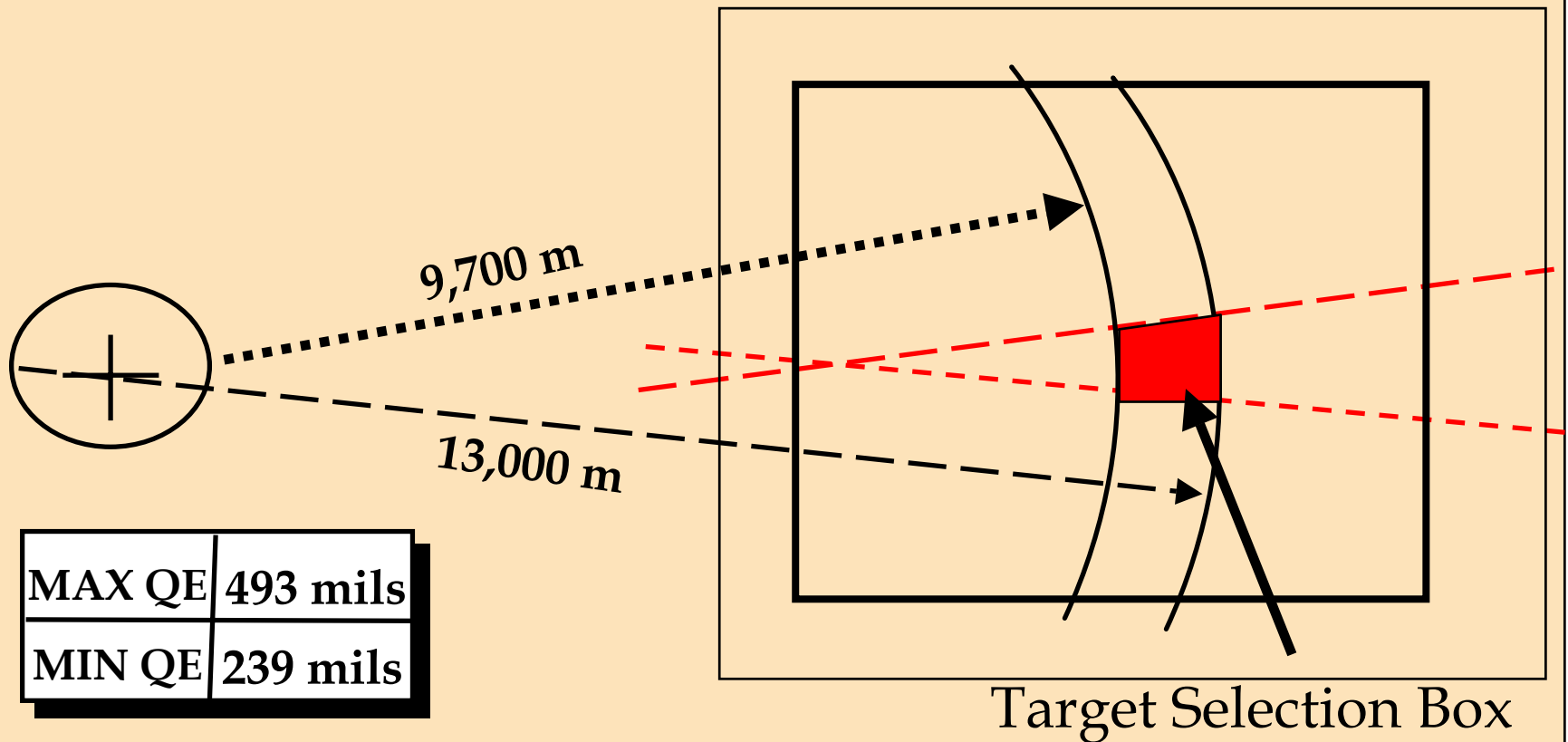
Launcher FCS Solution (versus APP "K-19")

Quadrant Elevation Limits



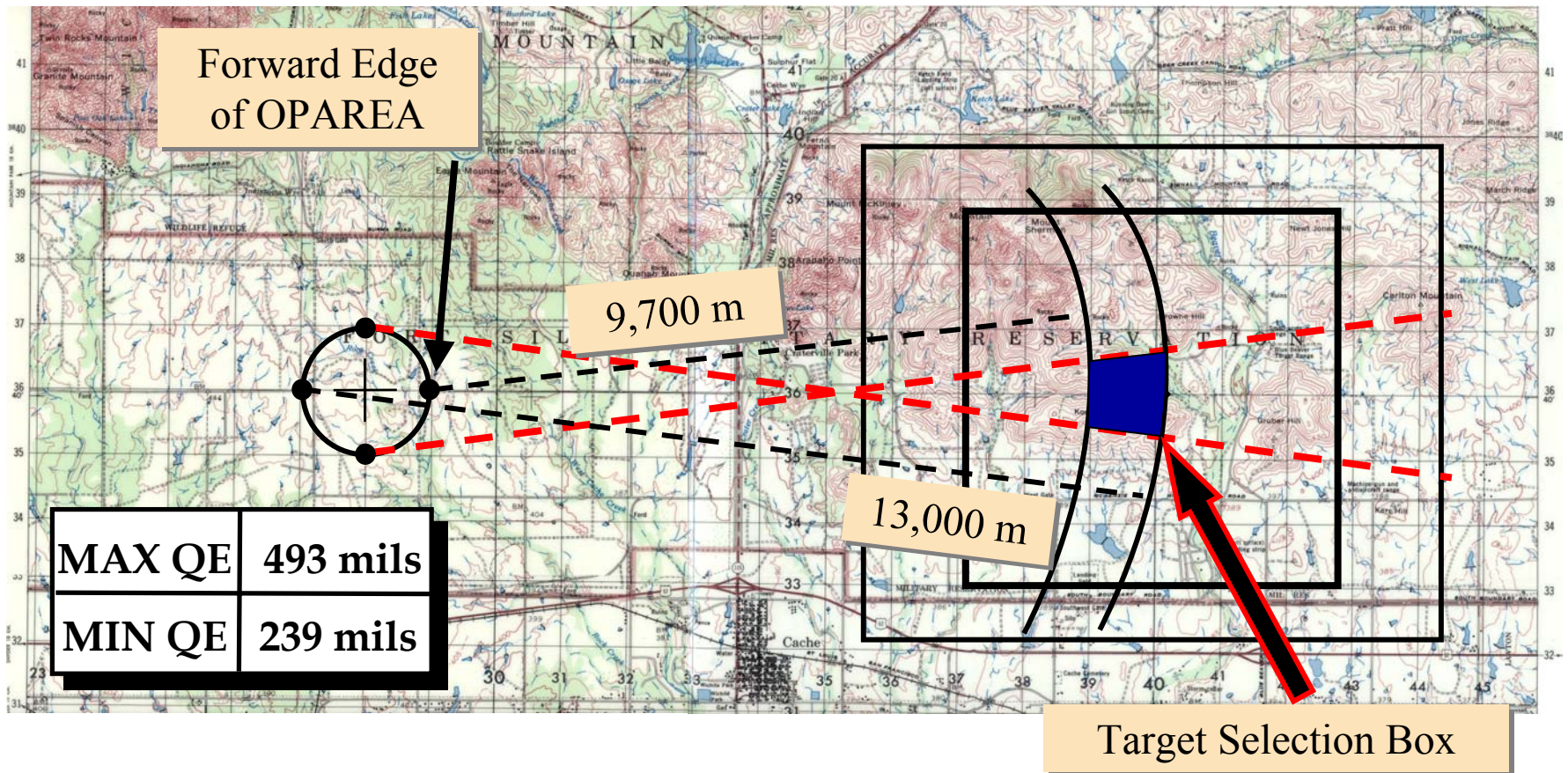
Launcher FCS Solution (versus APP pg. K-19)

Quadrant Elevation Limits



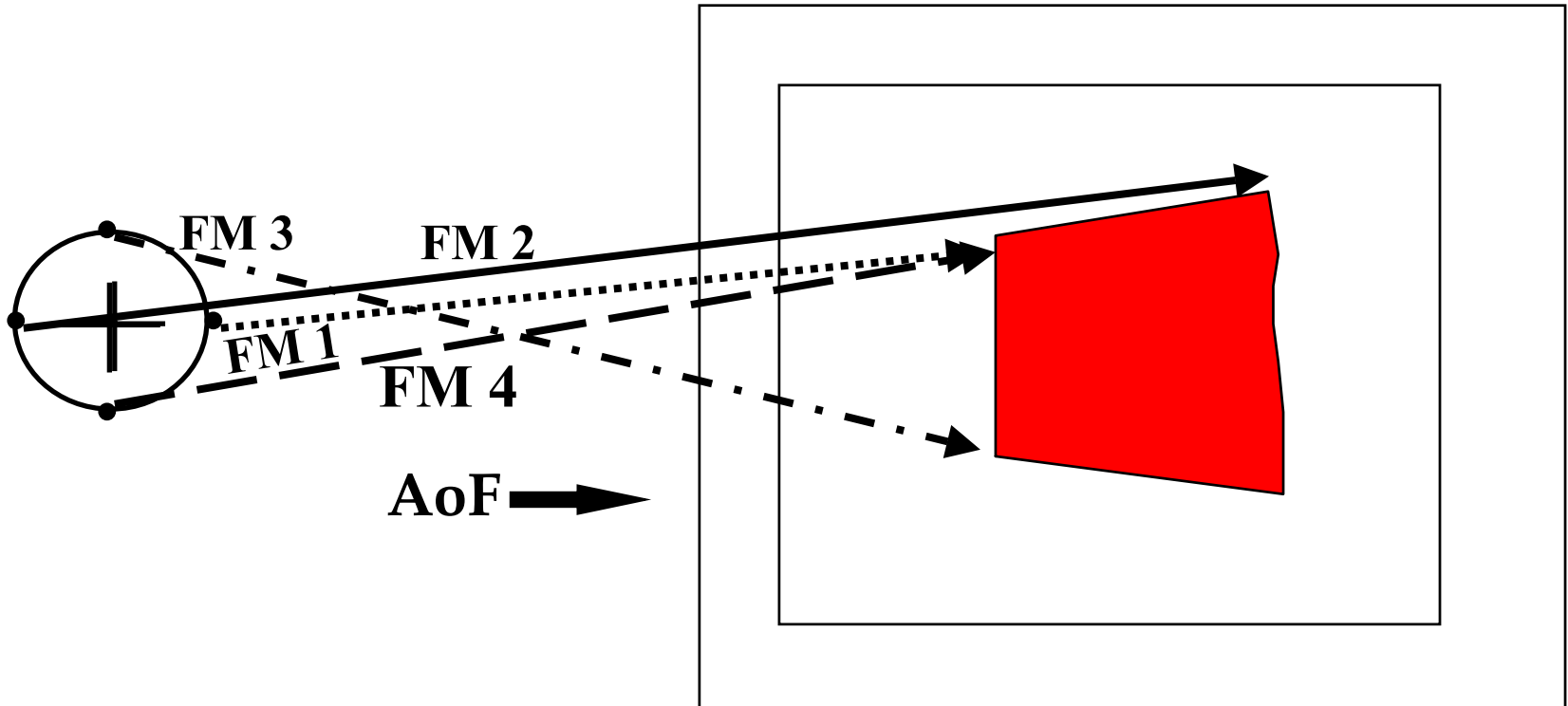
(APP "K-19")

Quadrant Elevation Limits



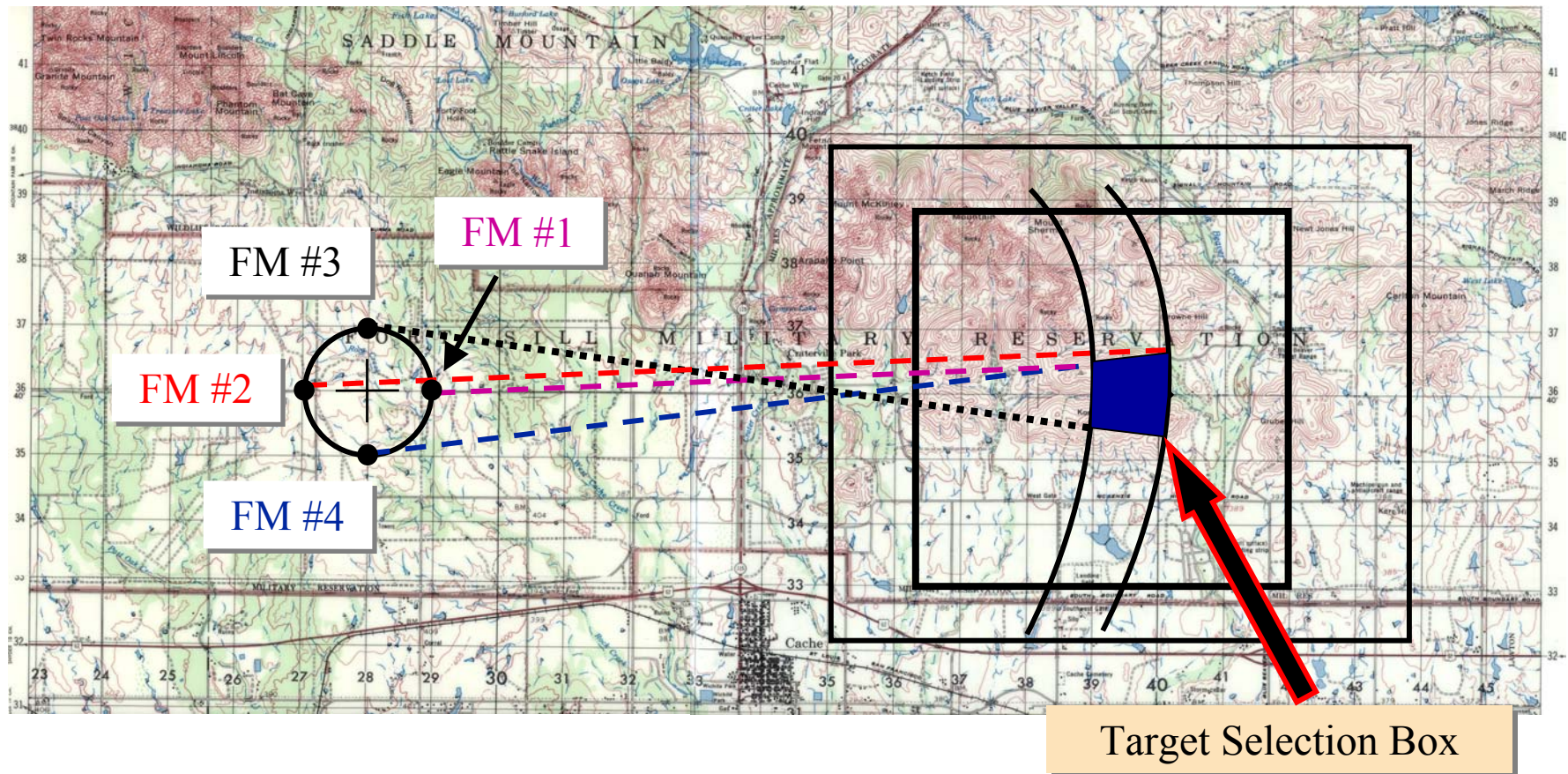
Launcher FCS Solution (versus APP pg. K-19)

Safety T Computation – with current MET



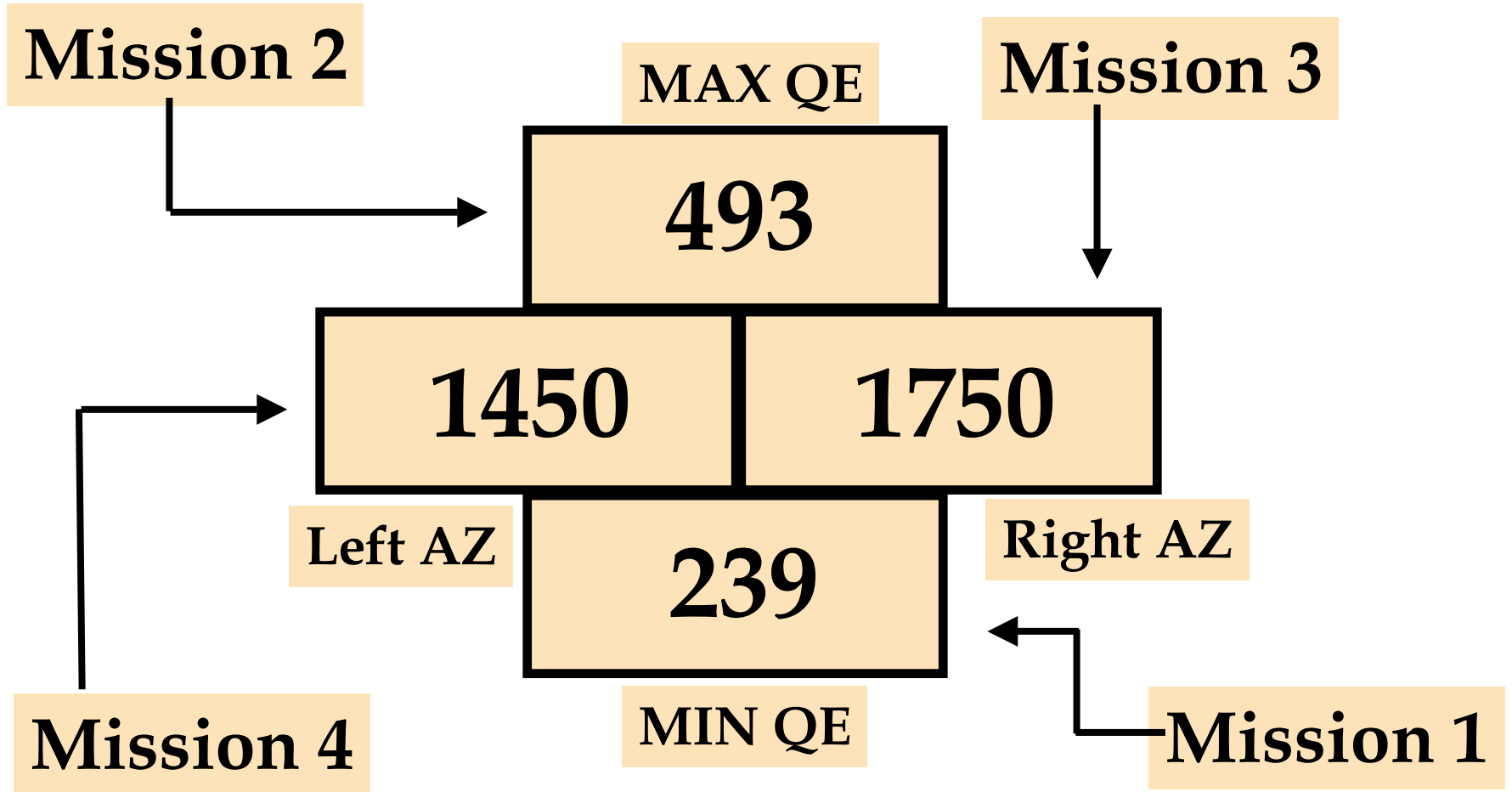
- FM 1 (Min QE): Fwd firing position to LLHC
- FM 2 (Max QE): Rwd firing position to ULHC
- FM 3 (Right AZ): Left firing position to LRHC
- FM 4 (Left AZ): Right firing position to LLHC

Safety T – With current MET



Launcher FCS Solution (versus APP pg. K-19)

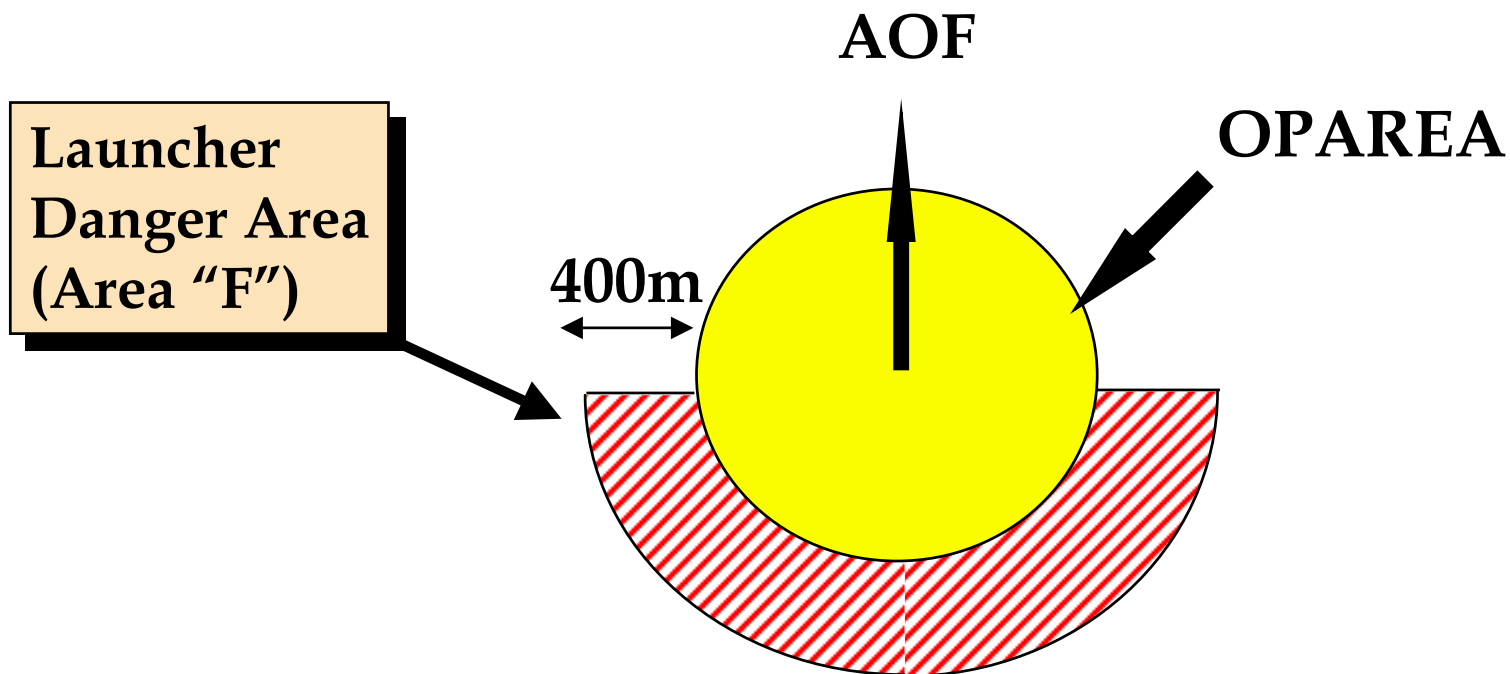
Safety T



Phase III – OPAREA SDZ

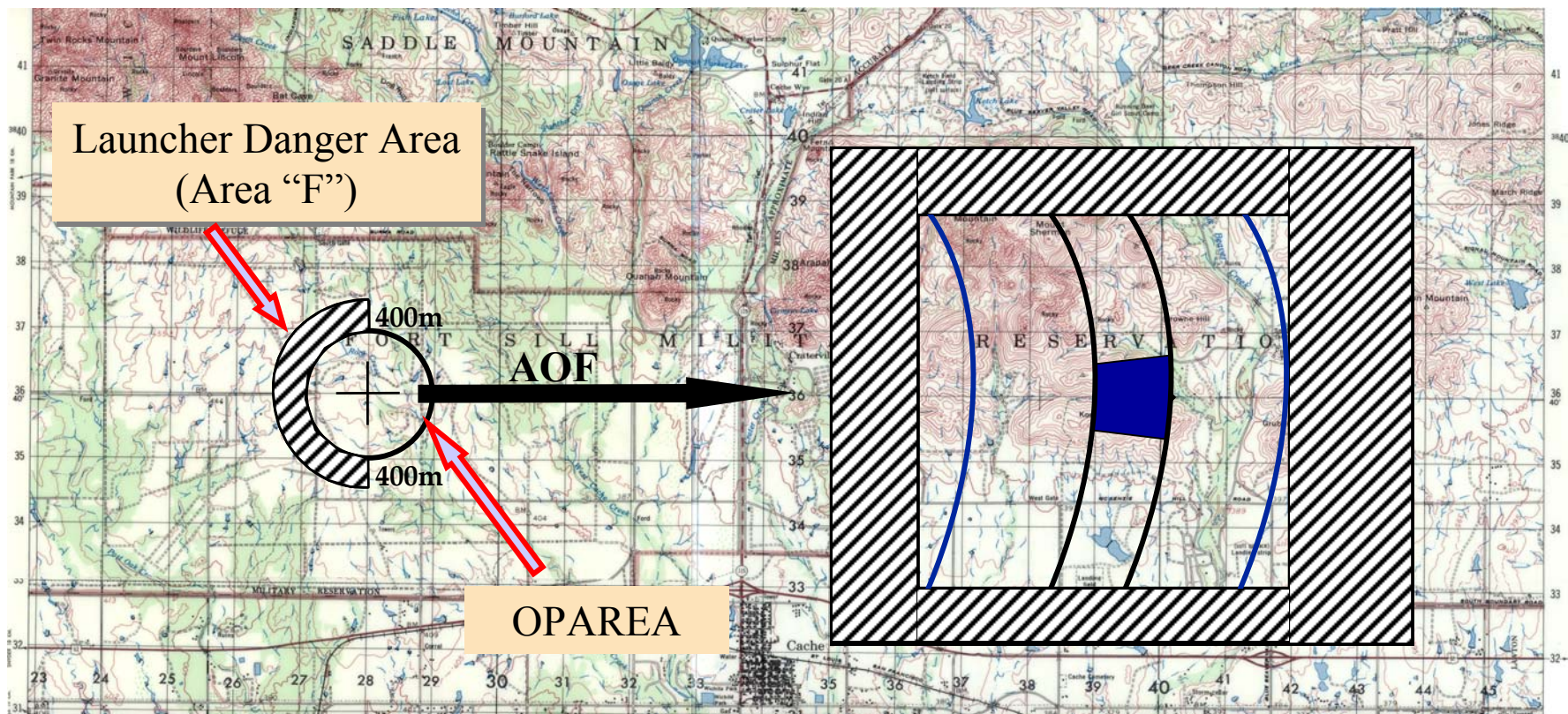
- **Launcher Danger Area**

Draw 400m arc extended beyond rear half of OPAREA

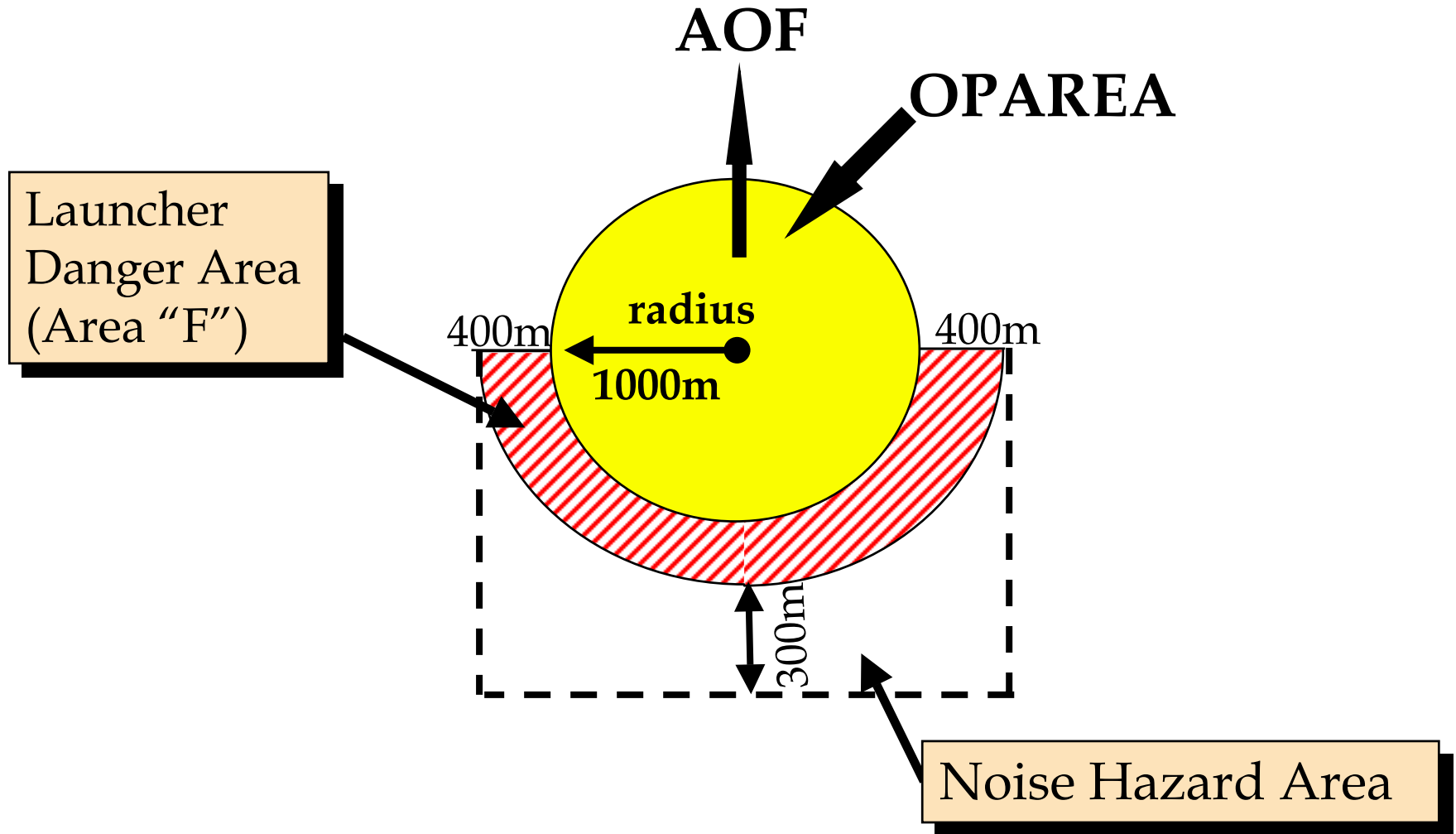


Phase III – OPAREA SDZ

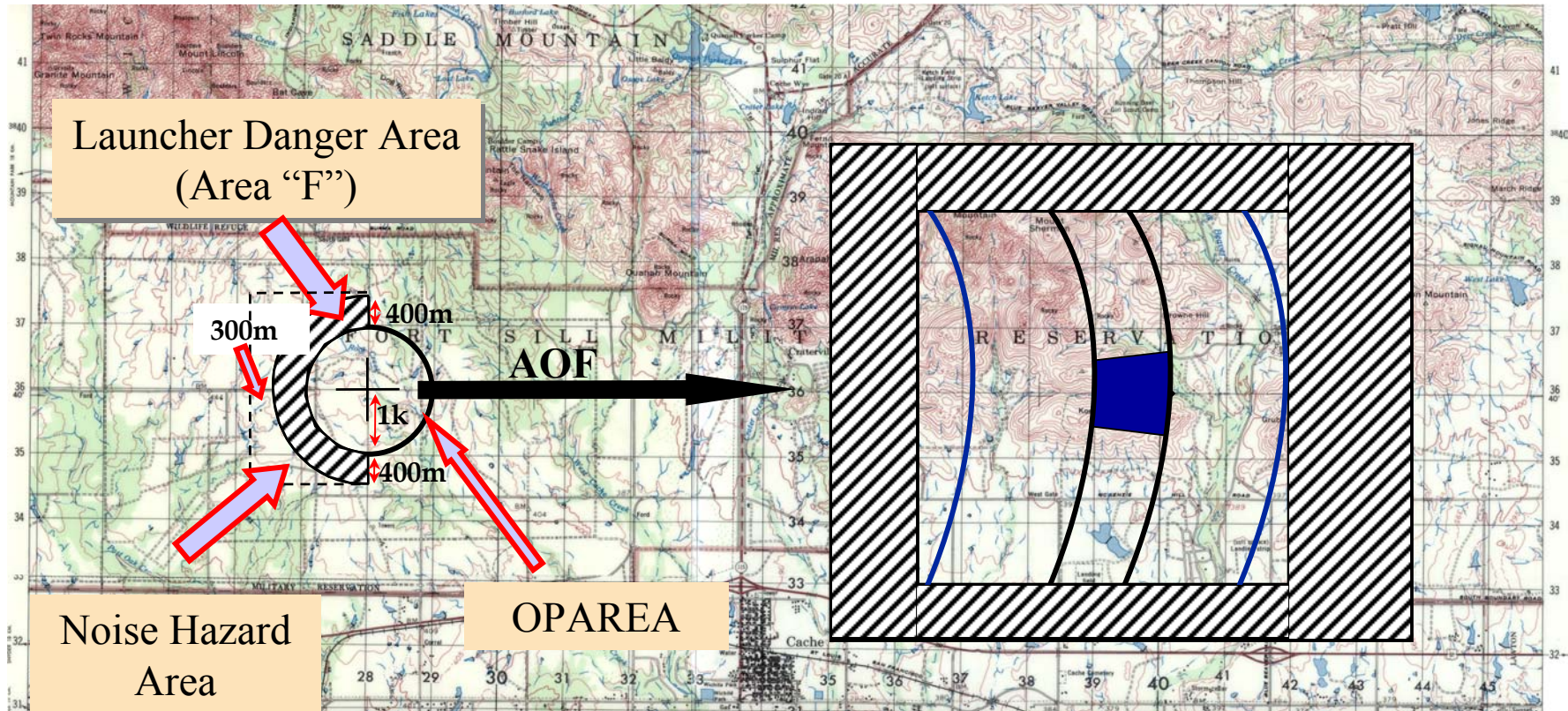
Launcher Danger Area
Draw 400m arc extended beyond rear half of
OPAREA



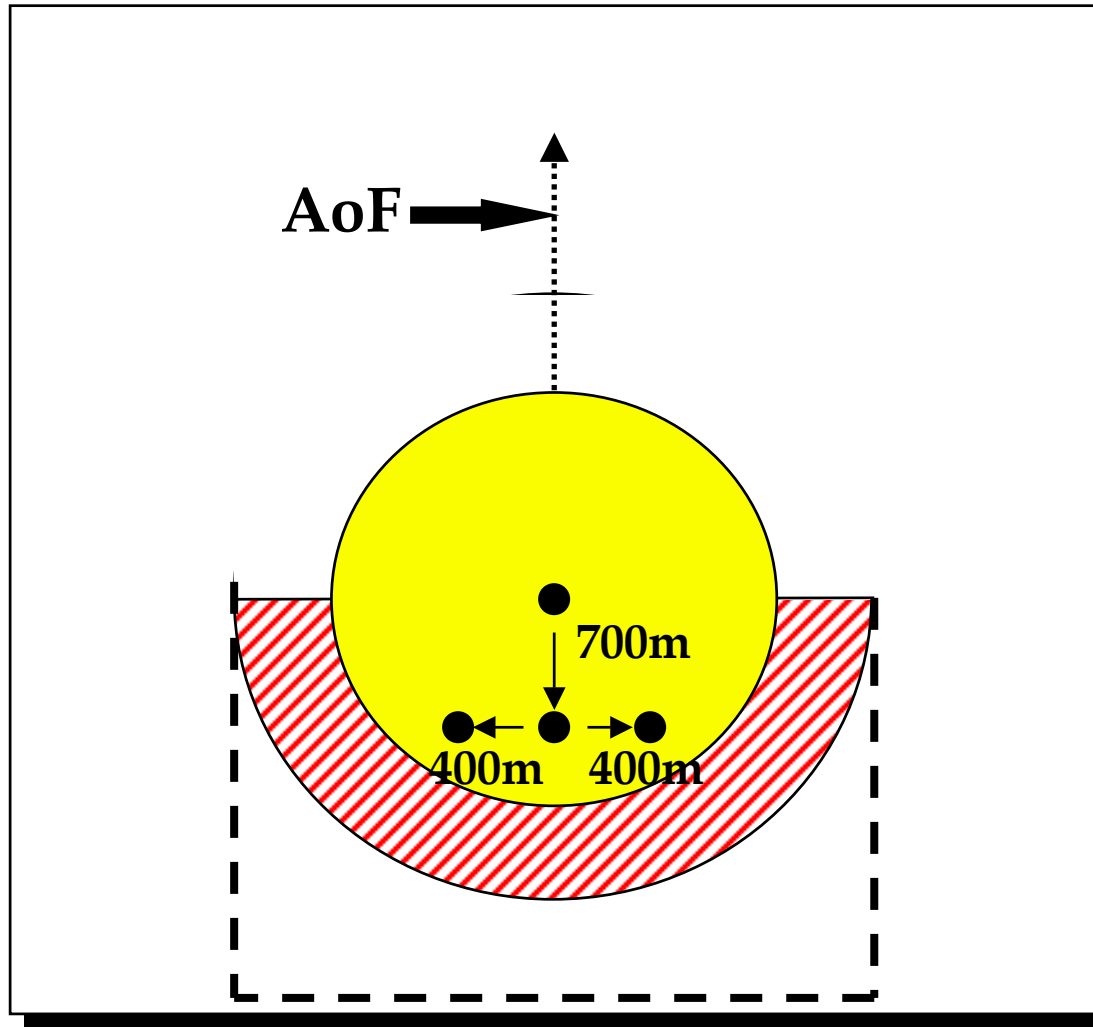
Phase III – OPAREA NHA (Method A)



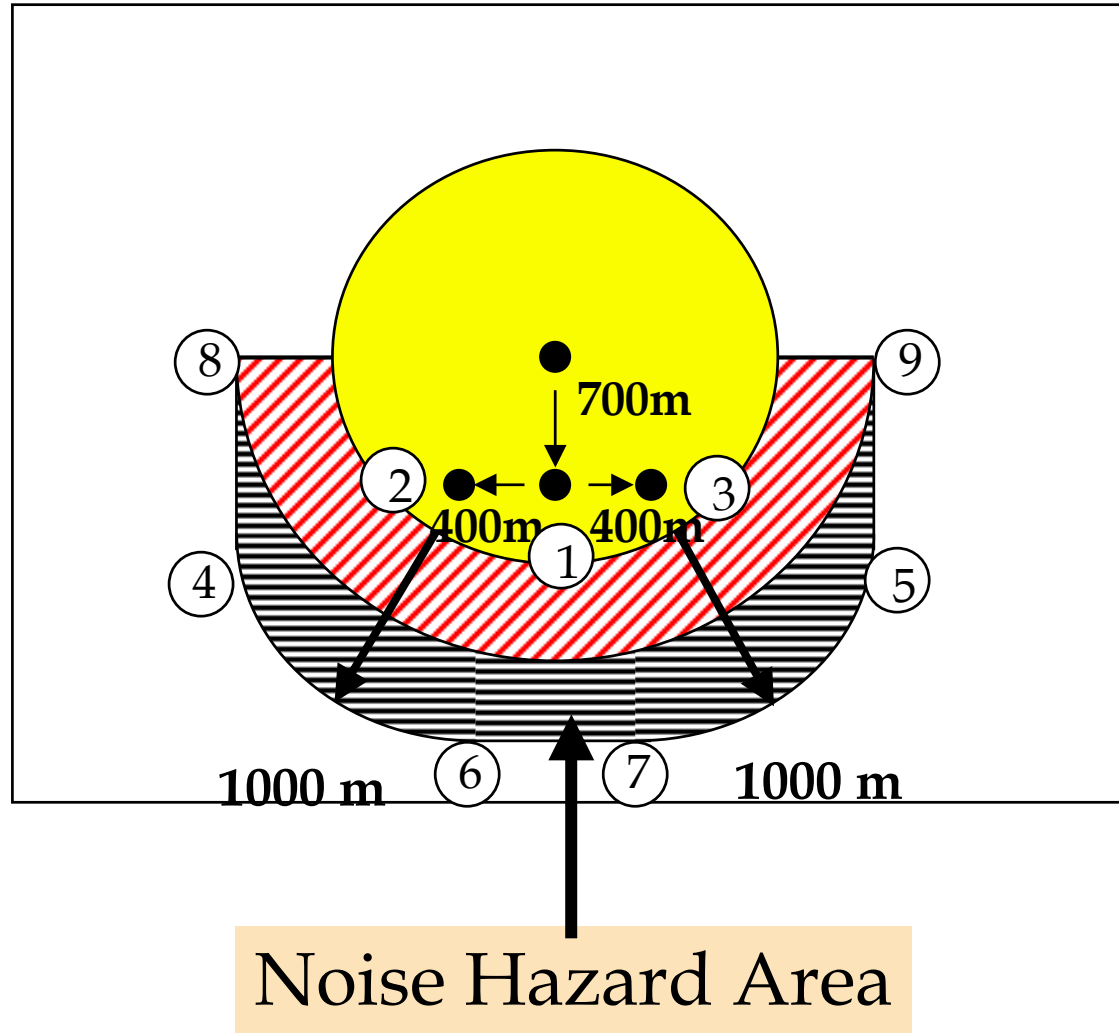
Phase III – OPAREA NHA (Method A)



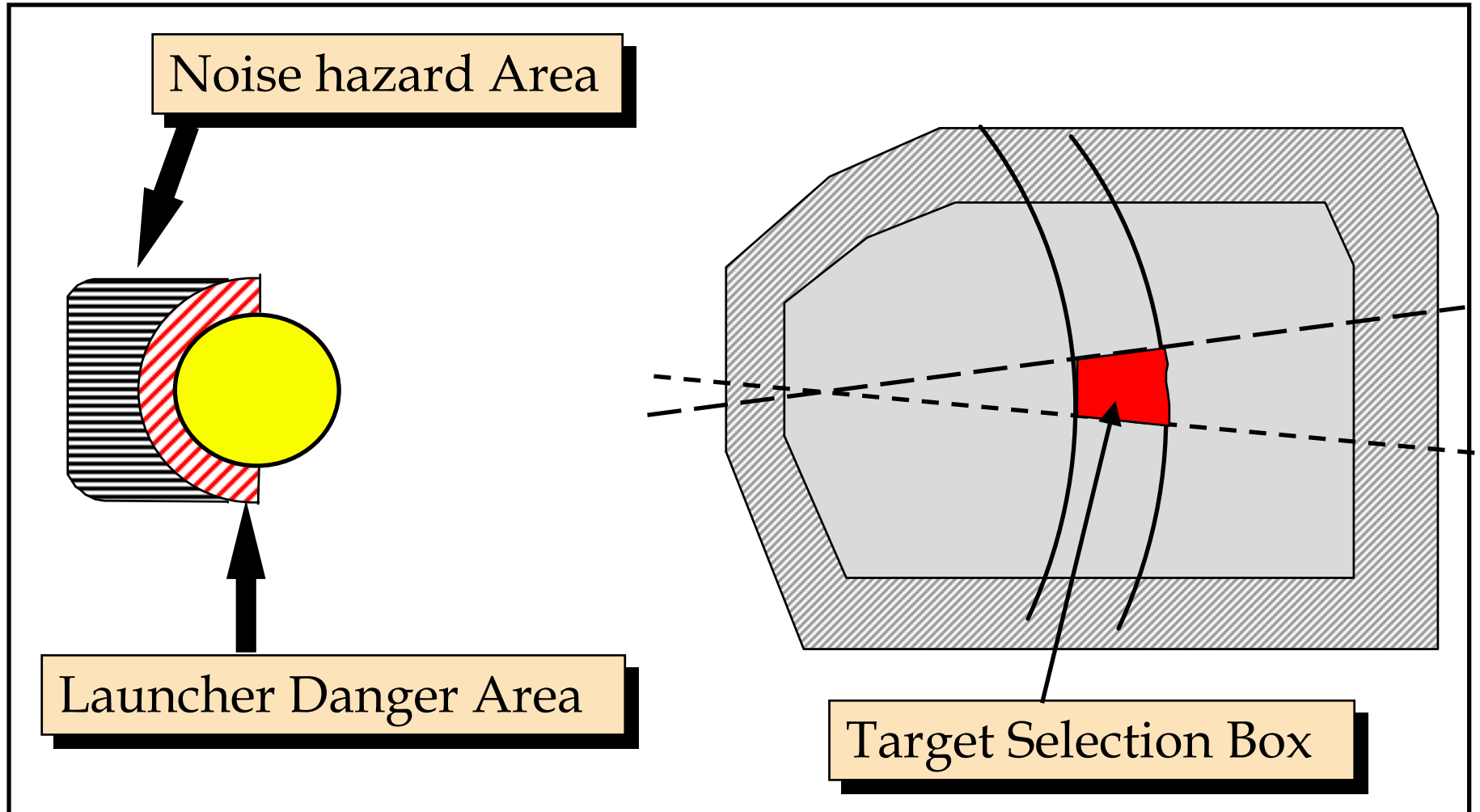
Phase III – OPAREA NHA (Method B)



Phase III – OPAREA NHA (Method B)

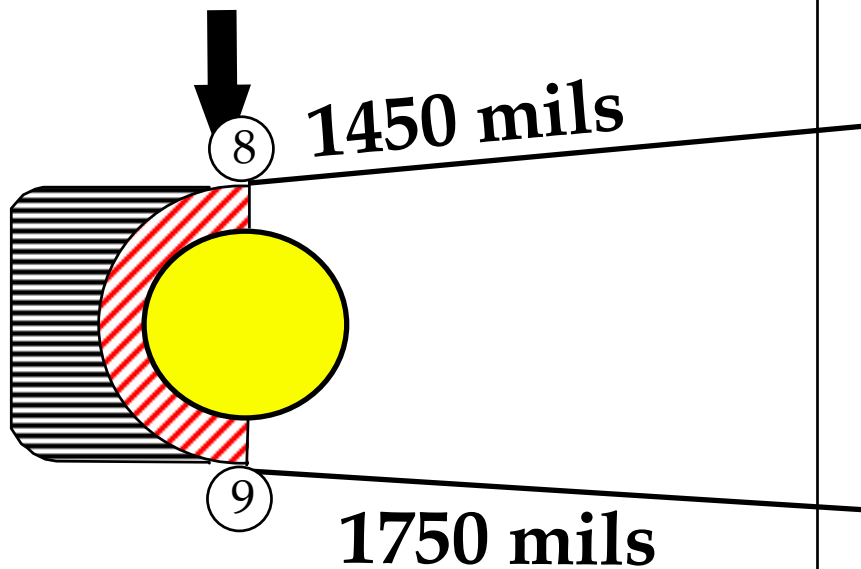


Phase III – OPAREA NHA (Method B)



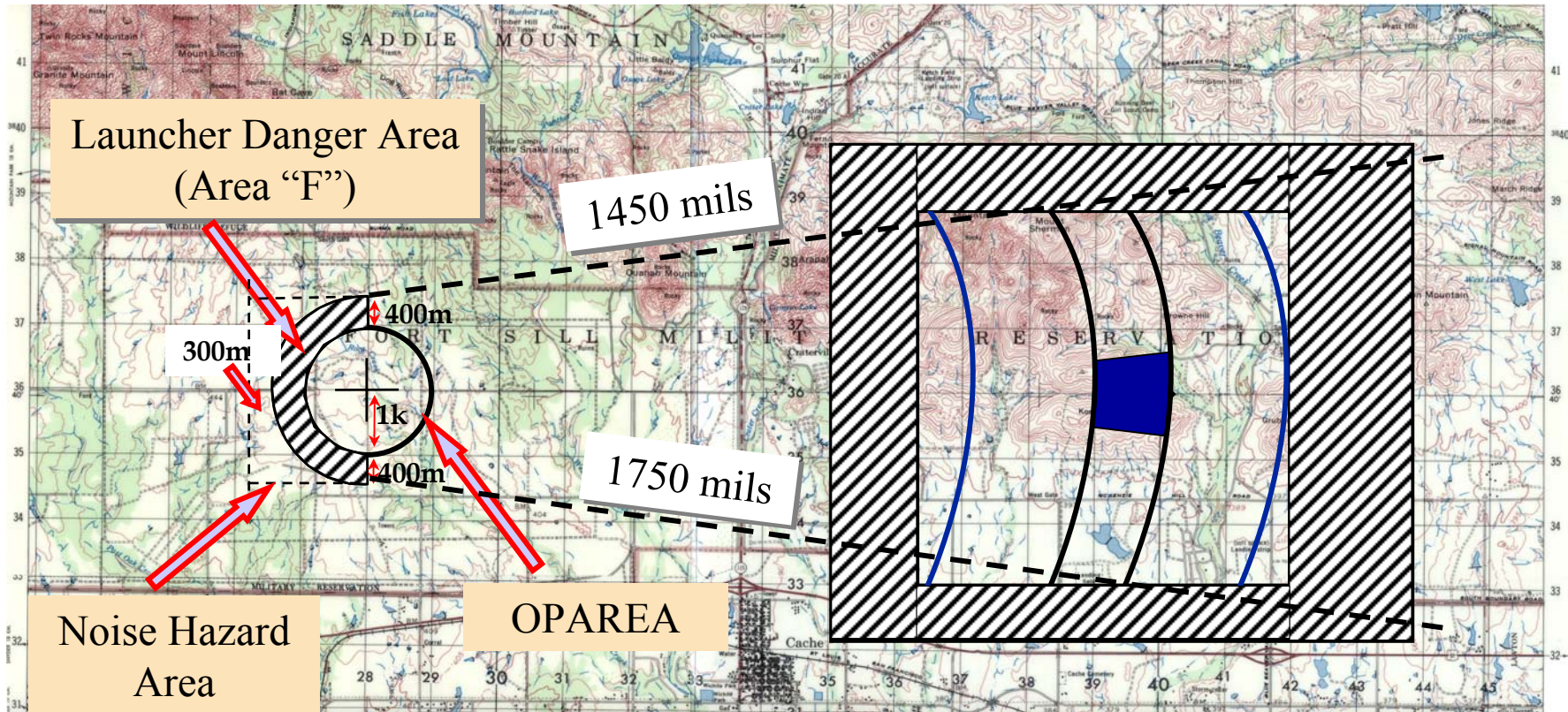
Phase IV – Flight Corridor

Launcher Danger Area



Line segments parallel to left and right azimuth limits.

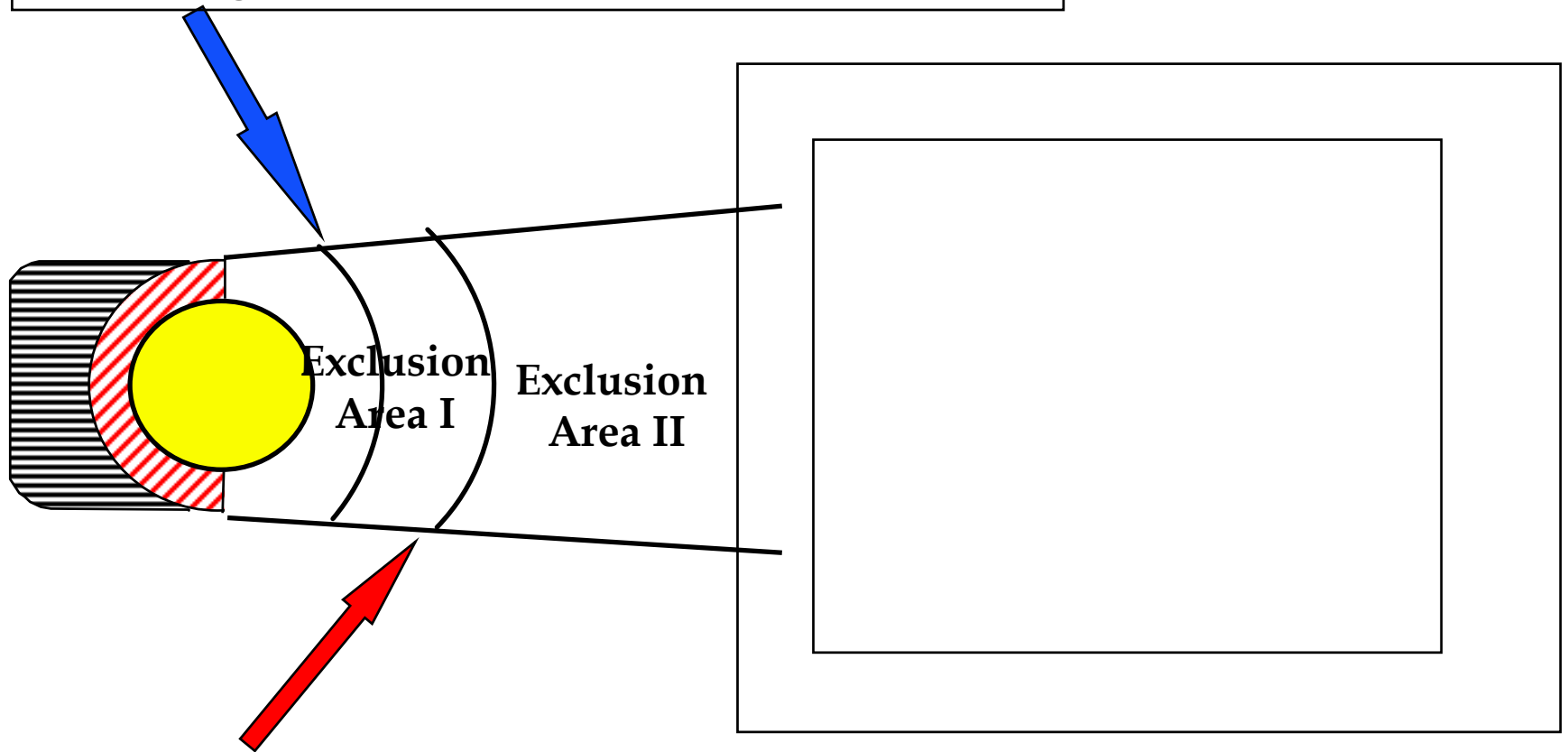
Phase IV – Flight Corridor



Line segments parallel to left and right azimuth limits.

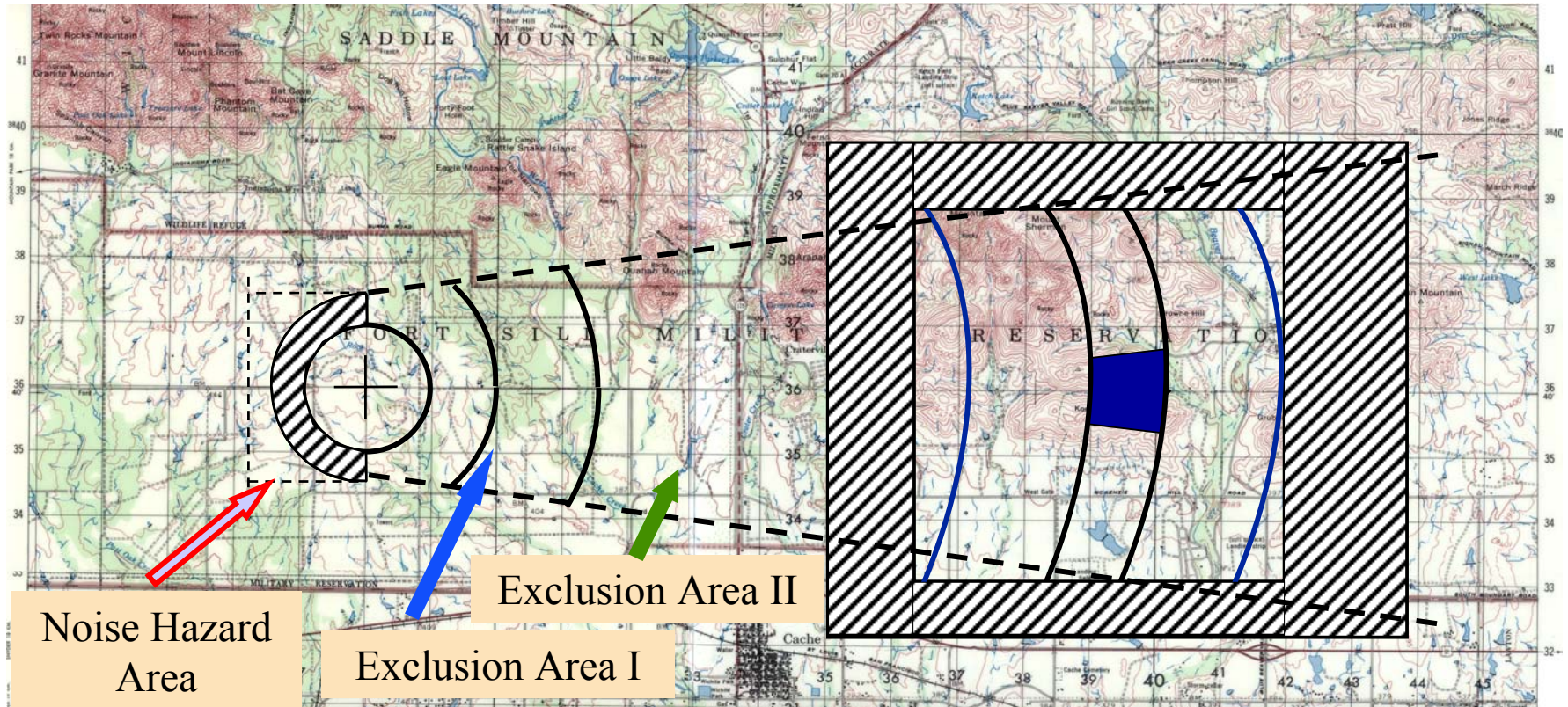
Phase IV – Exclusion Areas

1:1000 short round probability (1,000 meters from forward edge of OPAREA)

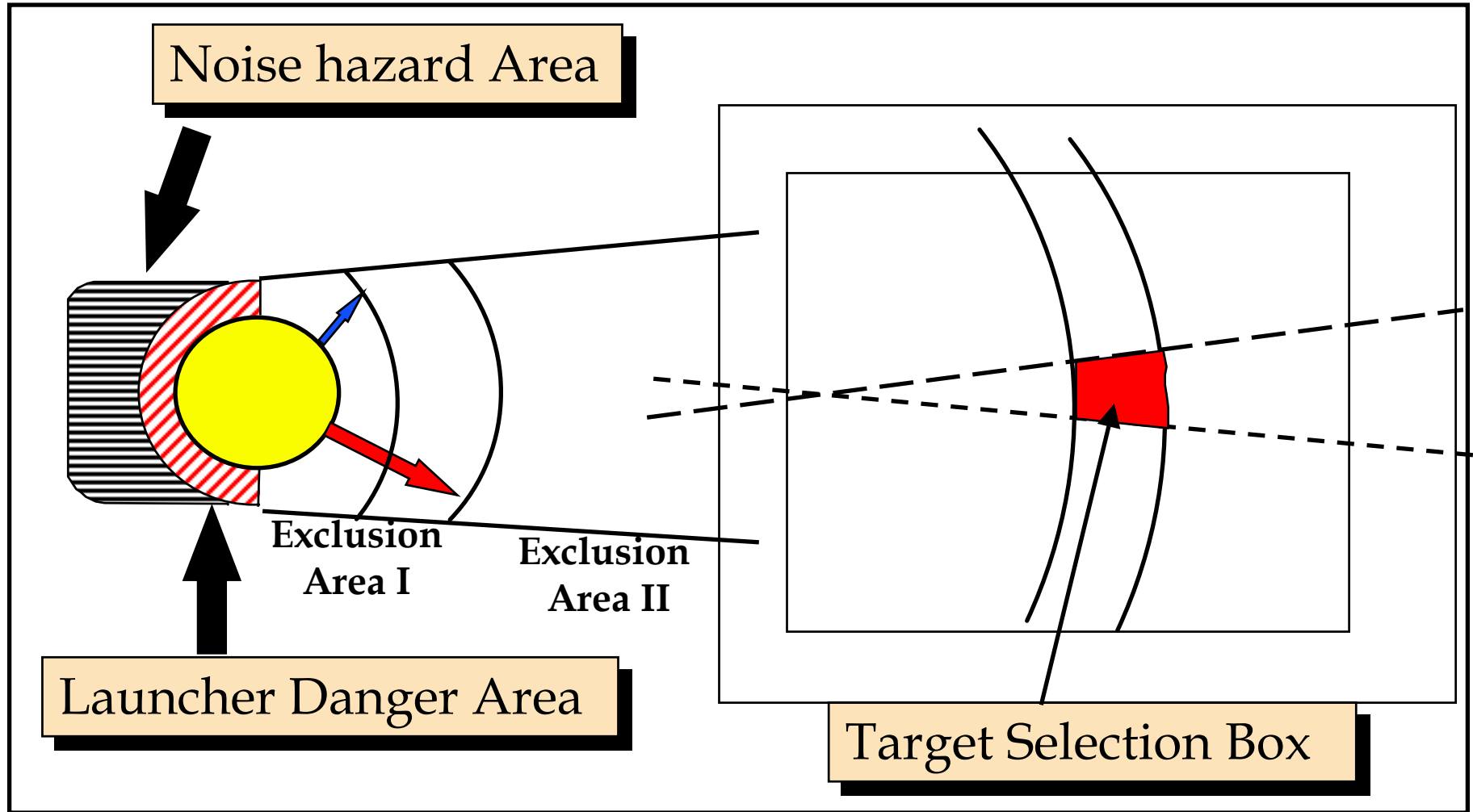


1:10,000 short round probability (2,500 meters from forward edge of OPAREA)

Phase IV – Exclusion Areas



OPAREA Method



Firing Point Method

Firing Point Safety

- Safety determined from single firing point into “target selection box”
- Installation impact area reduced by factors W_{\max} X_{\max} and Y_{\max}
- Unit determines SDZ
- Unit computes safety data and Safety “T”

Advantages and Disadvantages

- Advantages
 - Construction of Safety T is very simple
 - Allows the FDC to select targets from the largest possible impact area.
- Disadvantages
 - Training value for launchers reduced

Point to Point Method

Point to Point Safety

- Use Surface Danger Zones (SDZ) issued from Range Control
- Derived from single firing point to single target
- Computed from FCS data from two launchers
- Use of check launcher data to verify safety validity

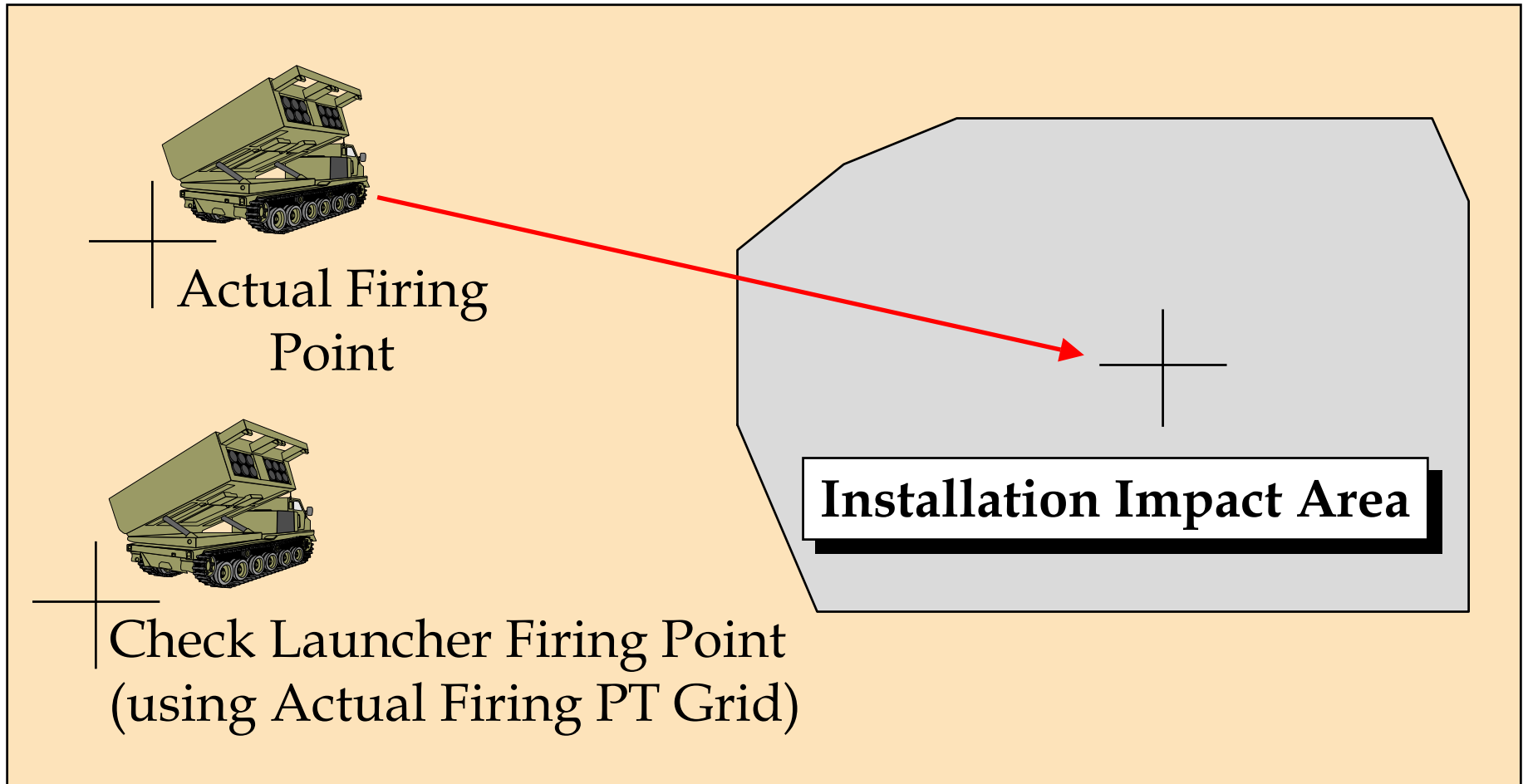
Advantages and Disadvantages

- Advantages
 - Quickly computes safety data
 - SDZ's determined by Range Control
- Disadvantages
 - Restrictive tactically for launcher and FDC sections
 - Must use another launcher to verify firing launcher

Point to Point Safety Computation

- Danger Area F 350 meters either side of launcher, 400 to rear of launcher
- NHA extends 300 meters to rear of Area F
- Flight Corridor extends parallel to Azimuth limits
- Exclusion Areas still apply (1:1,000; 1:10,000)

Point to Point Safety Diagram



Safety Computation

- Use check launcher with current MET
- Check launcher computes Azimuth, Quadrant Elevation and Time Fuze
- Firing launcher must be within command directed variance of check launcher

Gunnery Department MLRS Division

“Standards Start Here”

